



USER GUIDE

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Table of Contents

Copyright Notice.....	1
Disclaimer	1
Trademarks.....	1
Table of Contents.....	2
1. Introduction	6
2. How MudShark Works.....	8
Workflow	8
3. User Interface.....	9
Pane Interaction	9
List Panes	11
Change Visibility	11
Selection	11
Deletion	12
Expansion	12
Viewport Pane	12
Properties Pane	12
Results Pane	13
Boring Log Pane	13
Project Details Pane	13
4. Viewport Modes	14
View Mode	14
Active Site Stage	14
Take Off Task.....	15
Tools.....	15
5. Using the Viewport	16
Navigating.....	17
Pan	17
Rotate.....	17
Zoom	17
Zoom Fit	18
Zoom Selected	18
Zoom Window	18

Top Down	18
Selection.....	18
Multiple Selection	19
Drawing	19
Polyline Tool.....	19
Point	20
Transmute	20
6. Projects	22
Opening a Project	22
Filter Project Details.....	22
Creating a New Project	23
Creating a Copy of a Project.....	24
Moving Projects	24
Exporting Projects.....	24
Importing Projects.....	25
7. Plans	26
Insert Plan.....	26
Aligning.....	27
Rotate.....	28
Move	28
Scaling.....	29
Clear Scaling	29
8. Take Off	30
Working Area.....	30
Boring.....	31
Create a new Boring.....	32
Plotting an Existing Boring.....	33
Contours.....	34
Tracing	34
Transmute	35
Spot Elevations.....	35
Structures.....	36
Demolished Structure	36
Built Structure.....	37
Unchanged Structures	37

Create a New Structure.....	37
Taking Off Structure Boundaries	38
Point Altitudes	38
Structure Materials	40
Stripping and Respread	41
Editing.....	42
Adjusting Altitude	42
Move Selection	42
9. Materials.....	44
Global Materials	44
Project Materials.....	44
Factors.....	45
Bulking Factor.....	45
Compression Factor	45
Using Materials.....	46
10. Results	47
Ground Setup.....	47
Initial Ground Strata	47
Material Reuse	48
Calculating Results.....	48
Navigating Visual 3D Results.....	49
Edge Style	50
Calculation Troubleshooting	50
Results Grid.....	51
What Information is Available	51
Filters.....	52
Exporting Results	53
Microsoft Excel.....	54
Viewport Snapshot	55
Export 3D Vector Data.....	56
Appendix A. Keyboard and Mouse Shortcuts	57
General	57
Viewport	58
List Panes	58
Appendix B. System Requirements.....	60

Software.....	Error! Bookmark not defined.
Hardware	Error! Bookmark not defined.
Glossary.....	61
List of Figures.....	68

1. Introduction

MudShark is the next generation earthworks estimating software that is simple enough for anyone to use; you can be productive within minutes of your first use. This guide compliments MudShark's simple and flexible user interactions helping you move from beginner to expert in very little time.

The content of this guide has been designed so it can be read from cover to cover or skip to individual sections of interest. However it may be easier to follow some of this document if you load up the sample Project.

To open the Sample project from your installation:

- Click the **Project** tab in the ribbon.
- Click **Import Project...**
- In the **Import Project** window navigate to "Program Files\BrightBox\MudShark\Samples" or if you are using the 32 bit application on a 64 bit system "Program Files (x86)\BrightBox\MudShark\Samples".
- Select **HillTopHouse.bbx**
- Click **Open**.

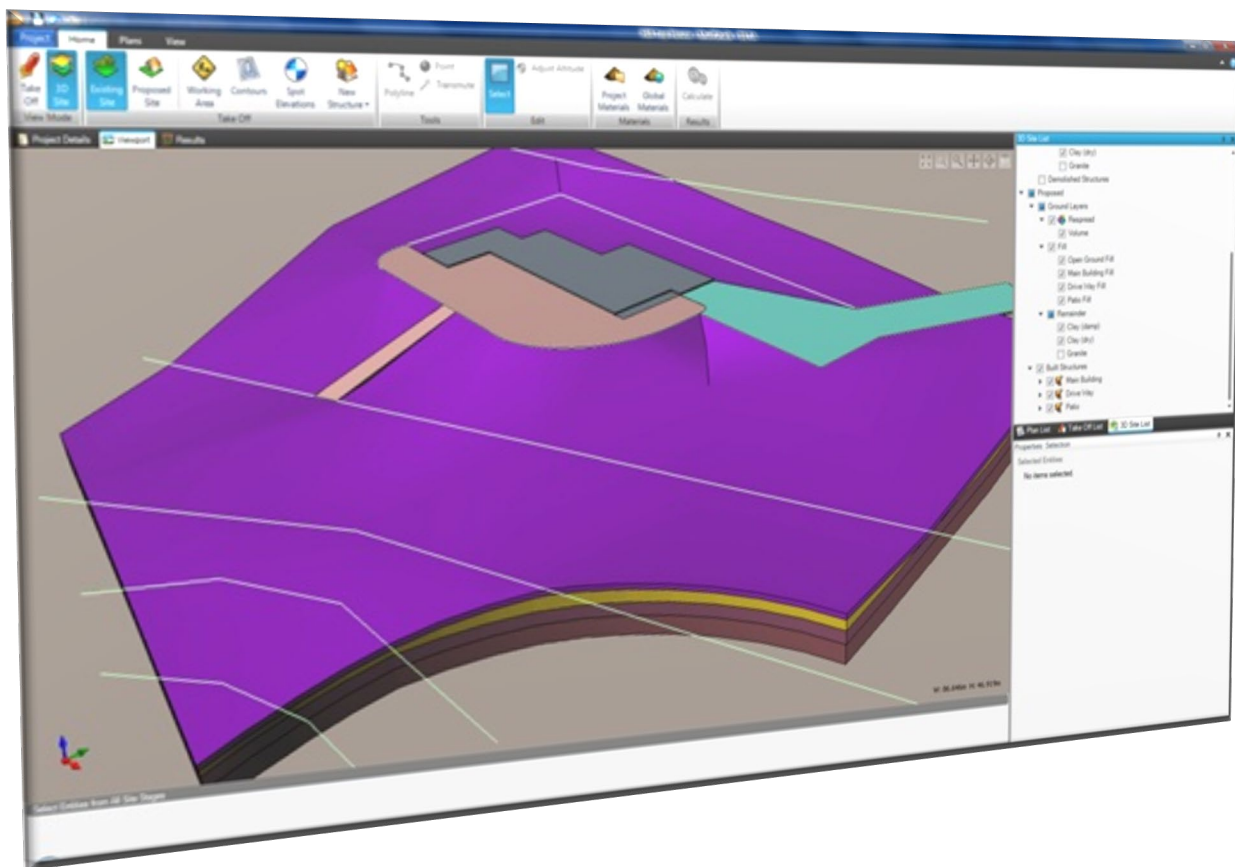


Figure 1. MudShark interactive 3D visualisation

After reading this guide you will be able to:

- Understand how MudShark works.
- Confidently use our fully interactive 3D Viewport.
- Manage your Projects and Plans.
- Take Off complex Working Areas, Contours, Spot Elevations and Structures quickly and accurately.
- Manipulate and reuse Materials and their Factors.
- Calculate and understand the Results.
- Trace where Materials originated from and has ended up.
- Calculate how much Material is being removed from the site or brought in from off Site.
- Produce stunning graphical images of your 3D Site.
- Produce detailed reports of Stripping, Cut, Fill, Respread and Structure Volumes.

2. How MudShark Works

Unlike most other cut and fill software MudShark uses Solid Modelling to calculate results for your Project. This means it is capable of producing much more accurate volume results with a richer visual display. In order to generate these results MudShark needs to build a 4D model of how the Site currently looks (Existing Site) and how the Site will eventually look (Proposed Site). These models are constructed using the Smart 3D Take Off tools to digitise the sites as they are represented in Plans.

Take Off the elevations of the land with Contours and Spot Elevations, as well as denoting Structures that need to be demolished or built. MudShark will use this information to construct 4D models of both site stages (which you can view) and calculate what needs to happen to the Existing Site to produce the Final Site. From these Strata Operations MudShark creates solid 3D Entities, these in combination with Material and reuse factors are used to calculate the Results which get displayed in 3D in the Viewport pane and in a grid in the Results pane.

Workflow

MudShark is made to fit into your existing workflow and there are few rules or restrictions on the order that you calculate your Project. However a suggested workflow of how you could work through your Project is:

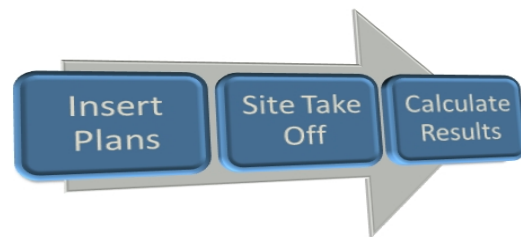


Figure 2. Suggested MudShark workflow

1) Insert Plans

- Insert, Align and Scale the Plan(s) that are required for the Project.

2) Site Take Off

- Enter the Project's Working Area.
- Enter each Site Stages surface elevations using Contours and/or Spot Elevations.
- Nominate the boundaries and Materials of Structures as required.

3) Calculate Results

- Configure Ground Settings.
- Calculate Results.
- Navigate and validate 3D results.
- Navigate and validate the results grid.
- Export results.

3. User Interface

MudShark's intuitive interface is designed to help you easily navigate the software and to complete your Project efficiently with a minimal learning curve. Modern user interface design components have been used allowing flexibility in how you interact with your interface.

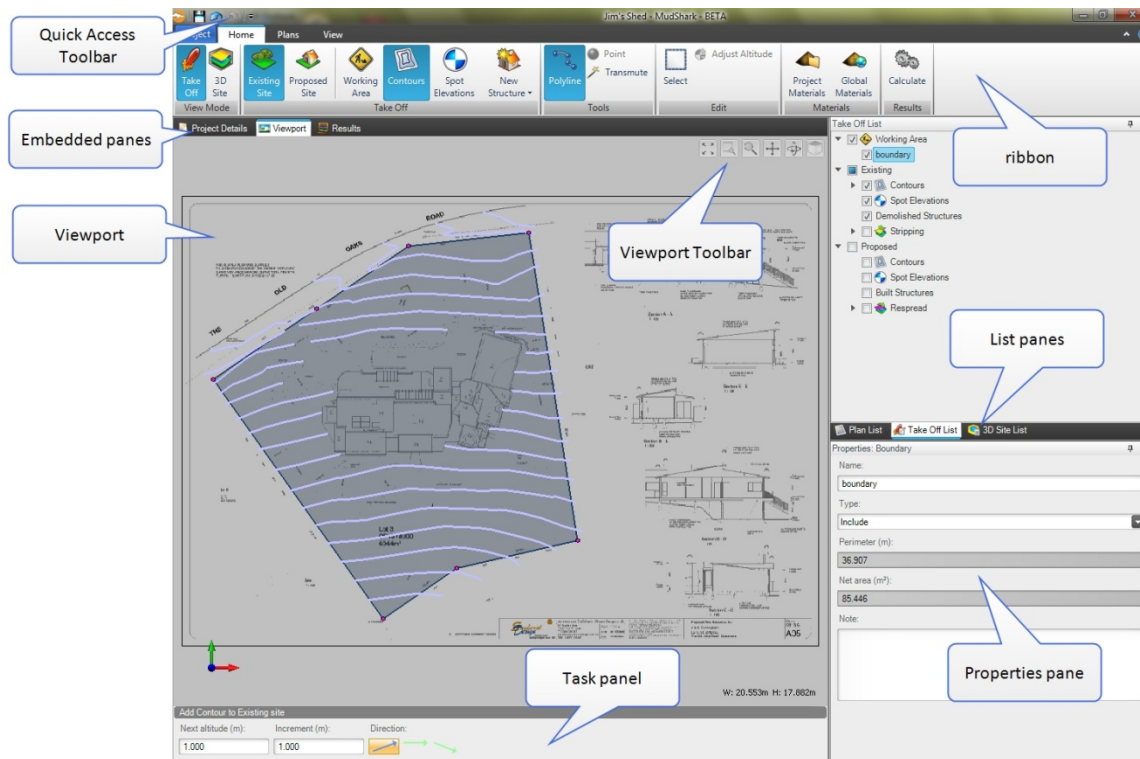


Figure 3. Main user interface components in MudShark.

Pane Interaction

MudShark panes are windows that you can have continuously open, allowing you greater efficiency and flexibility with how you work.

You can change the position and size of your Panes. Panes can be in one of three states:

- **Docked** to the edge of MudShark.
- **Embedded** in the centre workspace area.
- **Floating** anywhere on your screen(s).

If a Pane you want to work with is not visible on your screen on the **View** tab in the **Show Panes** group you can click on the control that corresponds to the pane you want to see. And whether the pane has been closed, hidden, obscured or unpinned it will be shown to you in its last visible state.

Docked Panes can be **Pinned** so that they remain visible or Unpinned so they collapse to the edge of the screen. To change the Pinned state, click the Pin button in a docked panes title bar.

To make an Embedded pane Docked to a screen edge:

- Click with the right mouse button on the embedded panes tab. A context menu appears.
- Click **Dockable**.

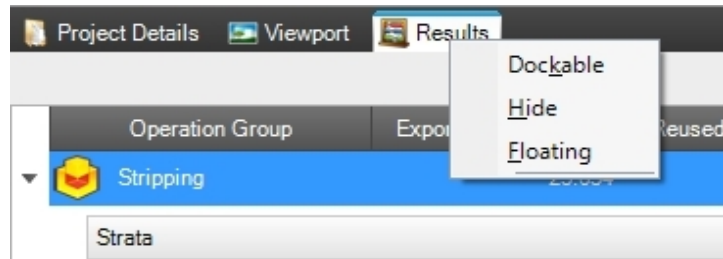


Figure 4. Clicking on an Embedded panes tab with the right mouse button.

To dock a floating pane or change the location of an already docked pane:

- Click and hold in the title bar of the pane.
- Drag the pane to the Docking Overlay control that represents the direction you want to dock the pane.
- Hover over the side you want to dock the pane to a live preview of how the pane will be docked is displayed.
- Release the mouse button to dock the pane.

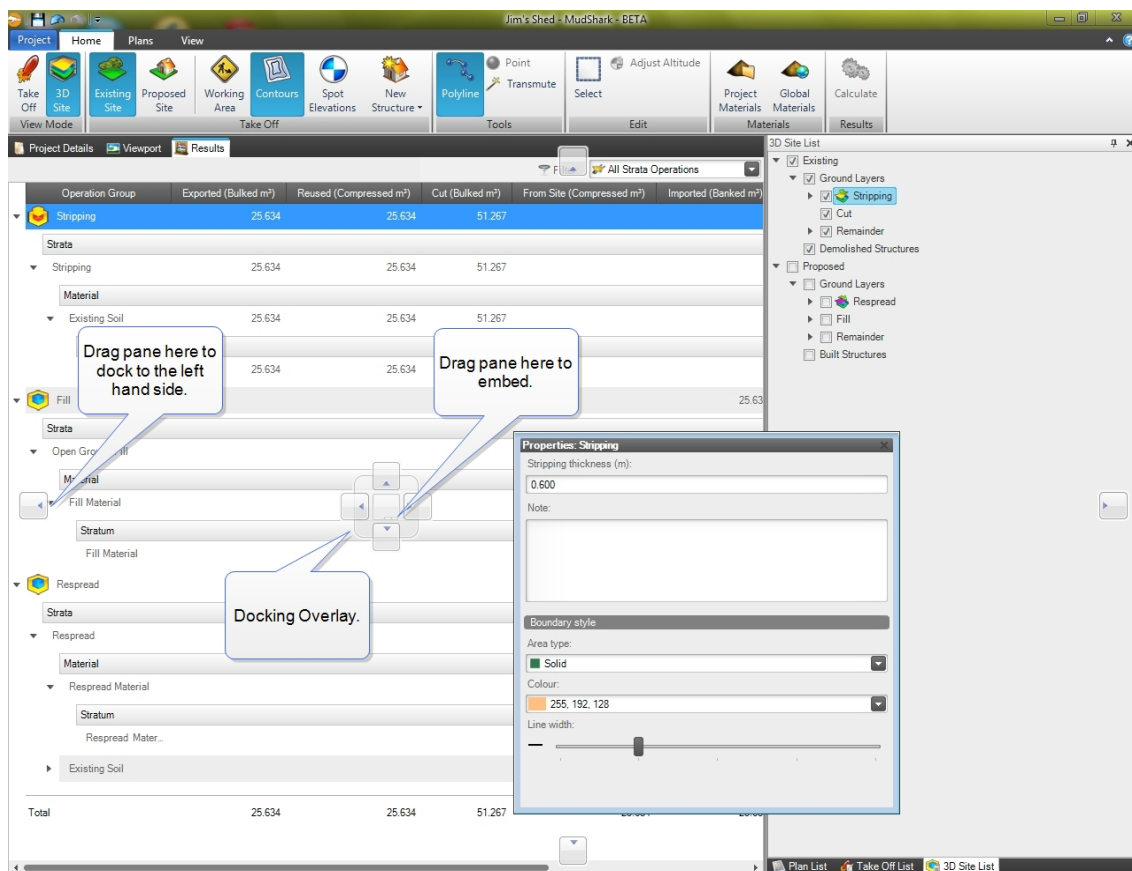


Figure 5. Docking Overlay controls appear when you drag panes around the screen to allow you to dock and embed them.

List Panes

These panes contain a list of the items that can be made visible in the Viewport. They provide a means of viewing and modifying what you have entered into the Project.

- **Plan List** pane contains all the Plans (and their layers) that have been inserted into the Project.
- **Take Off List** pane contains all the Take Off Entities that have been added into the Project arranged into Containers grouped by the Site Stage they belong to.
- **3D Site List** contains all the 3D Entities that have been calculated from the Take Off for the Site arranged into Containers grouped by the Site Stage they are associated with.

Change Visibility

With Plans, Take Off and 3D Entities your Viewport can appear cluttered. You can clear up your view and focus clearly on your current task by changing the visibility of items within a List pane. Some of this is handled automatically when you change the **View Mode**. However if you want to override the default behaviour you can choose to show or hide any Item.

Each item in a list contains a check box to the left of the item. This is the items visibility check box. If the item is visible there will be a checkmark inside this box. To change the visibility of an item select or clear the check box making the item visible or invisible respectively.

Note: You can still change the properties of items that are invisible.

Changing the visibility of a Container (An Item that can have sub-Items) will also update the visibility of its sub-Items. So you can quickly adjust the visibility no matter how many Entities you are interacting with; showing/hiding an entire Site Stage with a single click of the mouse button.

Selection

Items in the List panes can be selected by clicking on their names. When an Item is selected in a list it is also shown as selected in the Viewport.

If the item has children then all of its child items will be selected and highlighted in the Viewport. So you can select all Structures at once or select them one at a time.

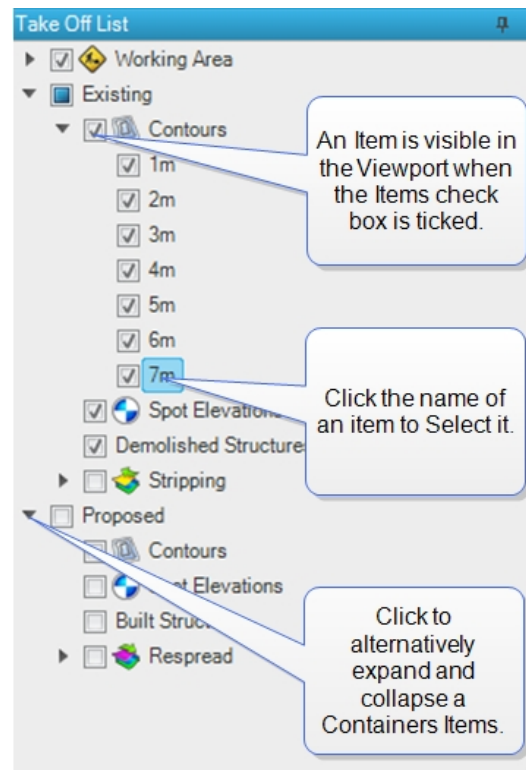


Figure 6. Take Off List pane with multiple Items visible in the Viewport.

If a single item is selected then, where applicable, you will be able to edit information about that item in the **Properties** pane. When you first create an item it will be selected by default so you will be able to edit its properties if you need to as efficiently as possible.

Deletion

Select the Entities that you want to delete then press the **Delete** key on your keyboard. If you delete something by mistake you can undo the deletion.

Some entries in the List panes cannot be deleted and will instead delete all the items that are the children of it. For example if you want to delete all Contours in the Existing Site stage you could Select the **Contours** item then Delete it. Each Contour in the Site Stage will be removed but the Contours container will remain.

Expansion

Some items in the list can be expanded by clicking on the arrow next to the item this will toggle the Item showing as expanded or collapsed. This can allow you to drill down to the smallest piece of information or collapse to a higher level to use a broad overview of your Project.

Viewport Pane

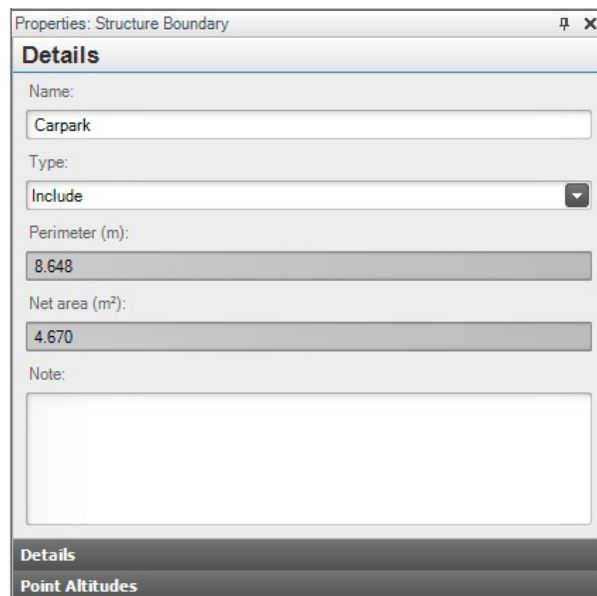
The **Viewport** is a view of the currently visible Items in all the List panes. This is where you perform Take Off from a Plan and view your 3D Site results.

For more Information see [5. Using the Viewport.](#)

Properties Pane

The **Properties** pane shows information about the current Project wide Entity selection. If a single item is selected then you will be able to edit information about that Item. If there is more than 1 Item selected then the Properties pane will contain a list of the number and type of Entities selected.

Most List pane Containers can also be edited in the **Properties** pane. If you want to change the colour of the Existing Site Stage Contours you can select the **Contours** item then choose a new colour. All Contours that are already a part of that group will have their colour updated.



The screenshot shows a software window titled 'Properties: Structure Boundary'. It contains a 'Details' section with the following fields: 'Name' (text input with 'Carpark'), 'Type' (dropdown menu with 'Include' selected), 'Perimeter (m)' (text input with '8.648'), and 'Net area (m²)' (text input with '4.670'). Below these is a 'Note' section with a large text area. At the bottom of the window, there is a dark grey bar with the text 'Details' and 'Point Altitudes'.

Figure 7 Properties pane showing information about the currently selected Entities.

Results Pane

This pane allows you to explore tabular views of your Results data that can then be exported to XLS or XML file readable by third party applications such as Microsoft Excel.

Boring Log Pane

Define the default materials that make up the ground on your site either as single list thicknesses or a complex array of multiple soil borings.

Project Details Pane

Contains information about your Project which is useful when choosing a Project to open. Additionally this is where you can configure a number of **Ground Settings** which affect the calculation Results.

4. Viewport Modes

Where it will increase the efficiency of performing your tasks, such as scaling Plans and performing Take Off, MudShark has utilised modes which apply to interacting with the Viewport. That is the current mode MudShark is in controls how the Viewport will respond to your interactions.

In many other programs excessive use of modes can easily lead to confusion. MudShark keeps you constantly informed about the current mode of the Viewport in the:

- **Ribbon:** the current mode indicators will be highlighted in the **Home** tab.
- **Task Panel:** the current mode is displayed as the title.

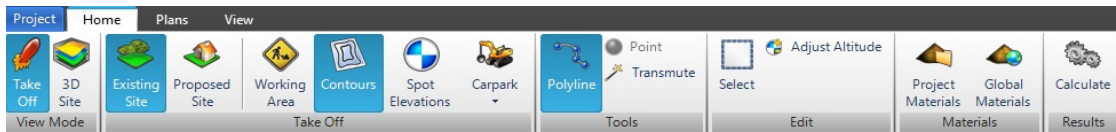


Figure 8. Active Modes are highlighted in the ribbon.

View Mode

The Viewport in MudShark has 2 **View Modes**:

- **Take Off** mode is made for accurate Take Off.
- **3D Site** changes the camera to use perspective to give a more natural looking 3D experience.

Note: In the image of the ribbon above. Take Off is the currently active View Mode.

Each View Mode remembers the visibility of all of your Items. If you reactivate a View Mode it will set all Items to have the same visibility they had when that View Mode was last used.

Active Site Stage

When performing **Take Off** MudShark uses the Active Site Stage to know where to insert the Entities. This can either be **Existing Site** or the **Proposed Site**.

The Active Site Stage in Figure 8 is the Existing Site which means that the next Contour that is drawn will be added to the Existing Site. To change the Active Site Stage to the Proposed Site click **Proposed Site** in the **Take Off** group on the **Home** tab.

Take Off Task

For each Take Off Entity you draw in MudShark you must first indicate what type of Entity you are taking off. The Task defines the type of Take Off Entity created. You can only have one active Take Off Task at any given time and each task has different Tools that they can use. For example you can Take Off Contours with the Polyline or Transmute Tools but not with the Point Tool.



Figure 9. Current Take Off Task is adding Contours to the Existing Site.

Tools

Tools control how the Viewport responds to interaction. There are many tools in MudShark including:

- Draw Entities in the Viewport.
- Select Entities in the Viewport.
- Scale Plans.
- Moving the camera in the Viewport.

While a Tool is active its corresponding button is highlighted in the Ribbon or in the Viewport Toolbar.

Some Tools are designed to be a **Single Use Tool**. That is once you have performed a single action with that Tool the previously active Tool is again activated. This is useful for Tools that are generally only going to be used once and are complementary to your main goal.

*For example if you are drawing Contours with the Polyline tool and you want to use the **Zoom Rectangle** to zoom in closer to an area of the Plan it is likely that you will only be using the Zoom Rectangle once. After the zoom is completed MudShark will reactivate the Polyline tool.*

Some Tools are **Multi Use Tools**. That is once you start using that Tool it stays active until you deactivate it or choose to use another Tool. Tools where you are likely to want to repeatedly perform the same action are usually going to be Multi Use Tools.

For example when Taking Off Contours you will usually be drawing more than 1 Contour to have to click in the Ribbon to start drawing a new Contour each time would be inefficient. As such the Polyline Tool stays active until you activate another Tool.

5. Using the Viewport

Most of the work you do in MudShark will be inside your Viewport. To maximise your efficiency with MudShark we recommend getting accustomed with how to move the camera around, draw, select and edit entities in the Viewport.

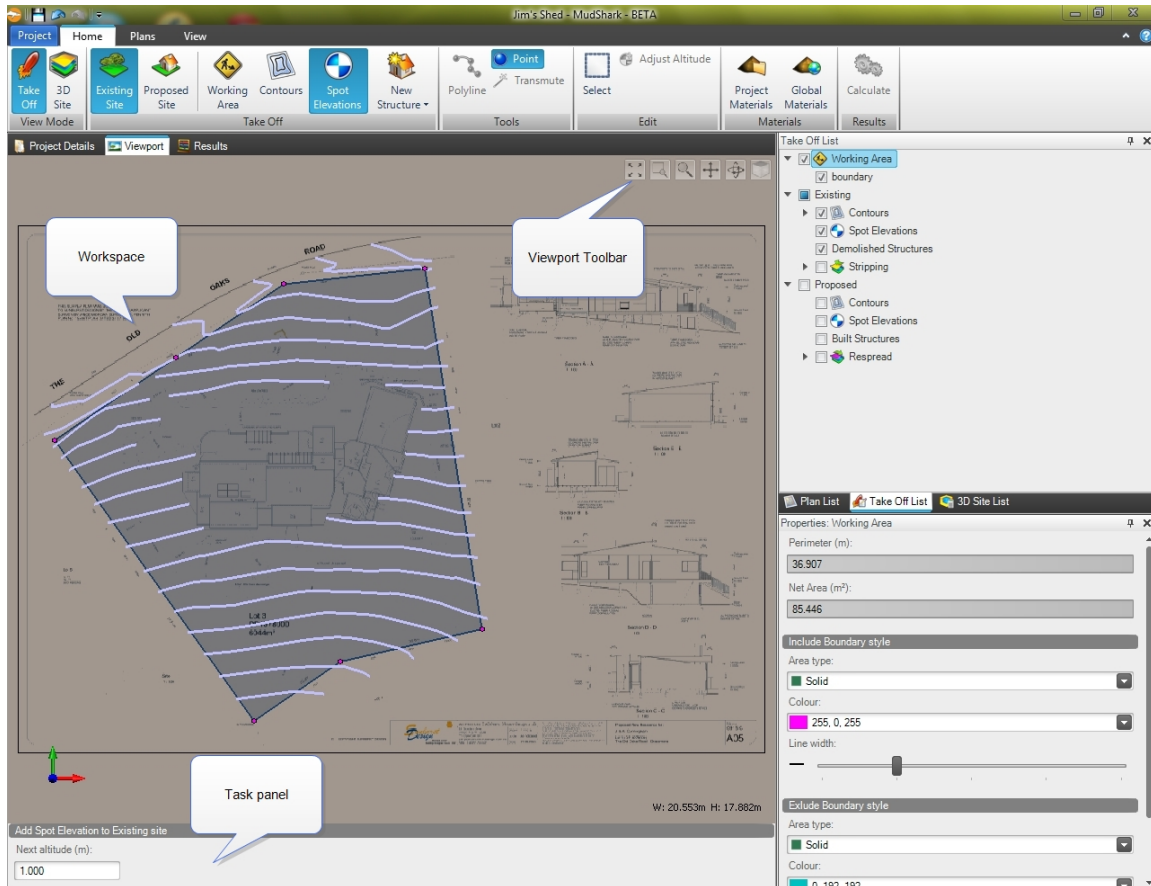


Figure 10. The Viewport displaying a Project with the Working Area and Contours for the Existing Site Stage entered.

The main areas in the Viewport pane are:

- **Workspace** - The area of the Viewport dedicated to the Visual display.
- **Viewport Toolbar** - Provides quick access to commonly used Tools to navigate around the Viewport Workspace.
- **Task Panel** - Provides contextual text about the current Task as well as helpful editors when performing Take Off or other Viewport related Tasks. To find out more about using the Task Panel refer to Tasks within the [8. Take Off](#) section of this document.

Navigating

The most efficient means of navigating around the Viewport is directly interacting with the Viewport Workspace using the mouse and keyboard.

A number of Viewport Tools require that the Viewport Workspace is active (has focus) before using them. The Viewport is activated when it is clicked in. To **activate the Viewport** to perform an operation that doesn't involve clicking (for example using the scroll wheel to zoom) we recommend that you click the right mouse button inside the Viewport Workspace.

Pan



To move the camera left, right, up and down you need to Pan it. The quickest way mid takeoff is to use your mouse:

- Click and hold the mouse wheel button in the Viewport.
- Moving the pointer in the direction you want to Pan.

Note: You can also Pan with your keyboard. Press and hold one or more direction keys in the direction you want to Pan when the Viewport is active.

Rotate



To get a view of your Site from a different angle you can rotate the camera:

- Hold down the Ctrl key.
- Click and hold the mouse wheel button in the Viewport.
- Moving the pointer will rotate the current view.

Zoom



Moves the camera in closer or further away, to change the Zoom in your Viewport:

- Activate the Viewport.
- Rotate the mouse wheel.

Zoom Fit



Click **Zoom Fit** in the **Viewport Toolbar** and the camera will zoom so that all the currently visible Entities fit the Viewport. This is a great way to return to an overall view of your Site.

Zoom Selected



Click **Zoom Selected** in the **Viewport Toolbar** and the camera will zoom so that all the currently selected Entities fit the Viewport.

Zoom Window



If you need to Zoom to a particular area of your Site:

- Click **Zoom Window** in the **Viewport Toolbar**.
- Drag a rectangular area in the Viewport Workspace.

The Viewport will then zoom in as tight as possible on that rectangle.

Top Down



To move the camera to get a bird's eye view of your Site in either 3D Site or Take Off View Modes click **Top Down** in the **Viewport Toolbar**.

Selection

The Select tool enables you to select only the Take Off Entities that you have drawn and the 3D Site Entities that have been generated to calculate the cut and fill.

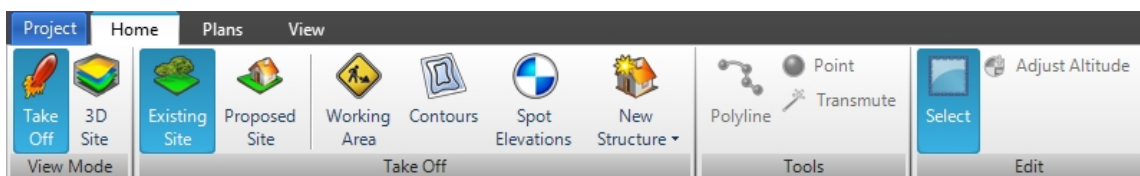


Figure 11. The **Select** tool active for the entire Site.

To enter Selection mode click **Select** in the **Edit** group on the **Home** tab.

You can then click on an Entity in the Viewport to Select it. If the Viewport can select the Entity it will be highlighted and selected in the other Panes in the application.

Multiple Selection

You can use the **Select** tool to select multiple Entities at a time.

You can select a rectangular area of Entities by clicking and dragging a rectangle around the items you want to select. Any selectable Entity that crosses or is contained within the rectangular area will be selected.

Alternatively you can hold down the Ctrl Key and Click on the individual Entities you want to select.

Tip: To select all selectable Entities visible in the Viewport press Ctrl + A while the **Select** tool is active.

Drawing

To ensure the most accurate Take Off all drawing Tools are only usable in the **Take Off** View Mode. If you make any mistakes while drawing you can undo what you have done by Clicking **Undo** in the Quick Access Toolbar. Alternatively you can delete what you have drawn by Selecting the Entity and then pressing Delete.

Polyline Tool

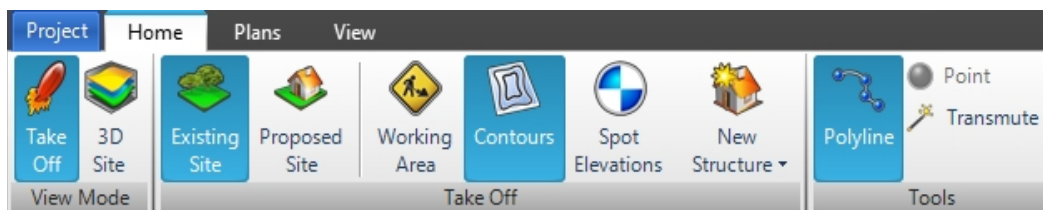


Figure 12. The Contours **Polyline** tool active for the Existing Site Stage.

A polyline is a continuous entity that is made up of one or more straight lines or arcs. To draw a polyline ensure **Polyline** is active in the **Tool** group on the **Home** tab.

Drawing Straight Lines

Straight lines in a polyline are drawn by clicking on the points of the shape you are drawing. If you are tracing a Plan that has vector data you can hold down the SHIFT key to snap to a Point.

Drawing Arcs

Drawing arcs has been streamlined with an intuitive drag operation into the normal takeoff procedure so that you can complete your takeoff as quickly as possible.

- Click the start point.

- Click and hold the left mouse button on the end point.
- Drag the line until it becomes an arc. You will see an overlay showing where the circular arc will be drawn.
- Release the mouse button when the arc is at the desired dimensions.
- You can now draw another arc, straight line or finalise the polyline.

Note: MudShark arcs are circular, if you are unable to get the arc to fit perfectly you can split a single large arc up into smaller segments.

Finishing a Polyline

MudShark uses Smart 3D Take Off tools when drawing so what you are drawing will influence how you can finish drawing a Polyline.

Right click will execute the default finalising operation for the type of entity you are drawing. If that entity is required to be a closed shape (e.g. A Boundary) the shape will automatically try and form a closed shape. If you are Taking Off a free form entity such as a Contour that doesn't have to be closed the right click will just end editing and will not try and form a closed shape.

If you want to close a shape you can explicitly do so by clicking on the start point of that shape.

Tip: Ctrl + J is the keyboard shortcut for closing a Polyline by joining the end point of a polyline to the start point.

Note: If you right click and the Polyline is not valid for the type of Entity (e.g. a single point for a Contour) then MudShark treats this like cancelled input.

Point

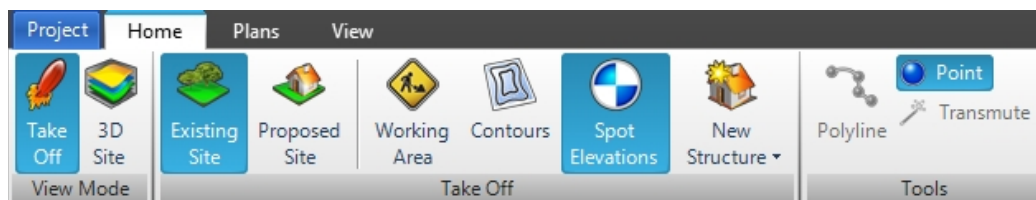


Figure 13. The **Spot Elevations** tool active for the Existing Site Stage.

Clicking **Point** in the **Tools** group on the **Home** tab will activate point drawing.

Points are entered by moving the mouse over the Viewport and clicking where you want to insert the Point.

Transmute

Transmute allows you to pick a Plan Entity and if the Plan Entity is compatible with the Active Take Off Task create a new Take Off Entity based off it.

To Transmute a Plan Entity:

- Click the **Transmute** tool in the **Tool** group on the **Home** tab.
- Select the **Altitude Source** in the **Task** panel.

- Click on the Plan Entity you want to use in the viewport.

This interaction is the same as the interaction for Select. Like the Select tool you can Transmute multiple entities at a time by drawing a rectangular area. All Plan Entities that cross or are found within that area will be transmuted.

Tip: You can transmute all the Entities on a layer or in a plan by clicking on the Plan or Layer name in the **Plan List** pane when the Transmute tool is active.

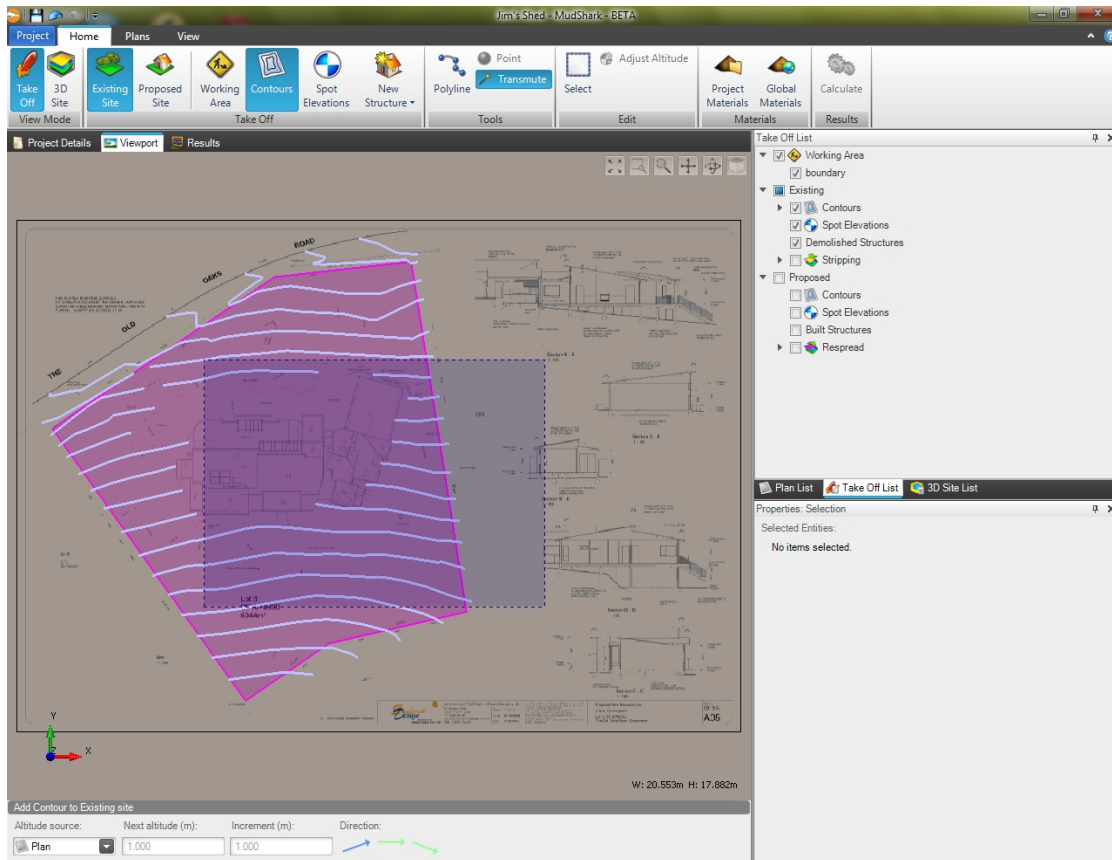


Figure 14. Transmuting a group of Entities.

Tip: When Transmute is active you can Transmute all visible Entities in the Viewport by making the Viewport active and then pressing **Ctrl + A**. Make sure that only the Entities that you want to Take Off are visible and that none of these Entities cross each other.

6. Projects

A Project contains all of your work that you do relating to an individual Site. You can have multiple Projects but only 1 open at a time within MudShark. When MudShark is launched it immediately presents itself ready for the next project.

Tip: If you want to view 2 Projects side by side you can open another instance of MudShark and open that Project.

It is important when working in MudShark to regularly save the changes you make to your Project. To ensure that you don't lose any data we recommend regularly backing up your Data Folder and Database.

Opening a Project

To open a Project that you have already worked on:

- Click the **Project** tab.
- Click **Open**.
- This will display a list of all the Projects that you can open including their details.
- In the **Open Project** window click on the Project you want to open.
- Click the **Open** button.

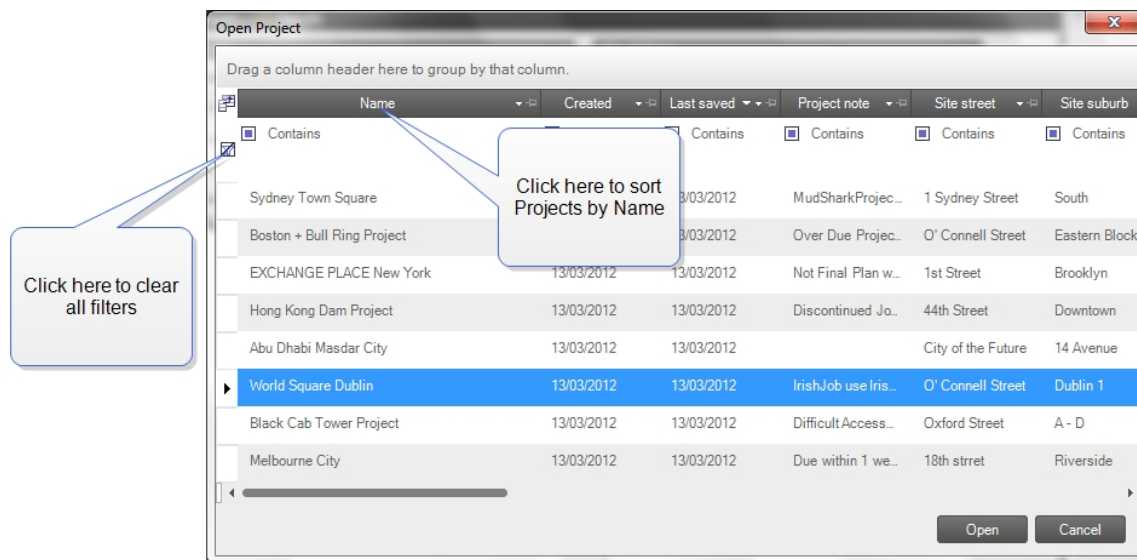


Figure 15. The **Open Project** window allows you locate and open your Projects quickly.

Filter Project Details

To find projects that meet certain criteria you can enter a filter value in the filter row. You can filter based on one or more columns and any Projects that don't match the value you are searching for are hidden. Many different types of

filters can be combined so that no matter how many Projects you are searching through you will be able to find the Project that you need.

To filter based on more than 1 value for a particular column you can click on **(Custom)** in the filter value box. This will show the **Custom Filter** window which will enable you to build up complex criteria for a single column.

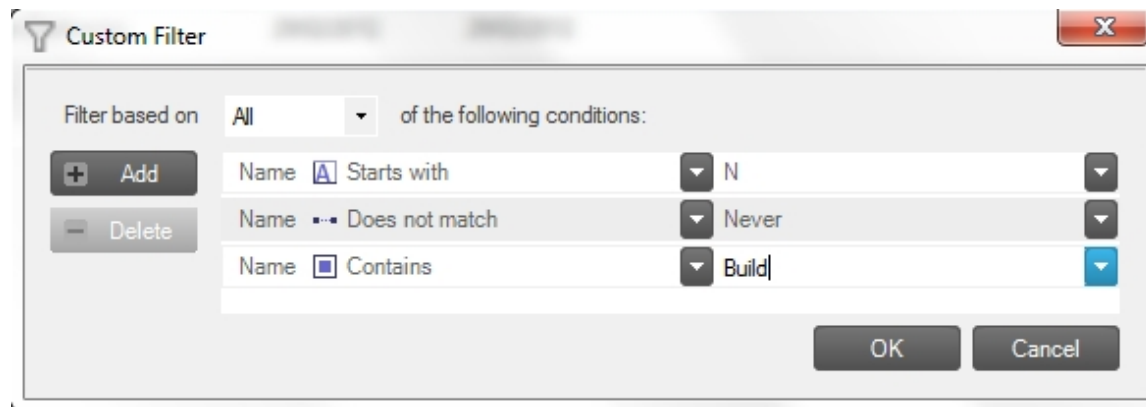


Figure 16. Custom Filter window allows you to define complex filters on a column in the Open Project window.

To clear the search value for a column you can click on the **Clear Filter Criteria** button next to the value or clear all filter criteria for the row by clicking on the **Clear All Filter Criteria** button in the row header.

Creating a New Project

You can start work on a New Project at any time:

- Click the **Project** tab.
- Click **New**.

While there are no required fields you must put in for a Project it is recommended that you give the Project a name that will help you identify it should you ever need to Open at a later time. You can enter a **Name** for your Project in the **Project** tab inside the Project Details pane.

Creating a Copy of a Project

If you want to base a new Project on an existing Project or explore site balancing options you can Create a Copy of the currently opened Project:

- Click the **Project** tab
- Click **Create a Copy...**
- In the **Create a Copy** window enter a **Name** for the new Project.
- Click **Create a Copy**

A copy will be created. If you want to work on the copy now you have to open the copy of the Project. You can do this as you would normally open an existing Project or by clicking on the **Copy Created** notification that is displayed when the copy is created (see Figure 18).

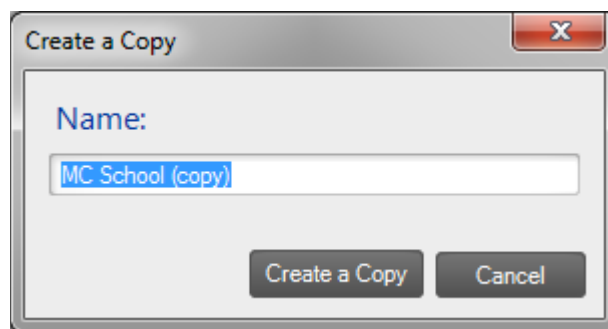


Figure 17. Create a Copy of the currently opened Project.

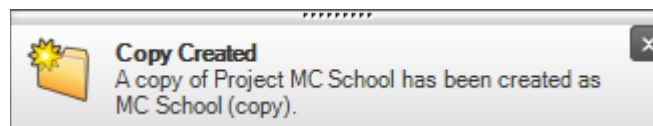


Figure 18. Open the copy of the Project by clicking on this notification.

Moving Projects

You may need to transfer Projects to other machines or send a Project to someone else. To share your Project you need to Export it to a BBX file which can then be imported into MudShark on another machine.

Exporting Projects

- Open the Project you want to Export.
- Click the **Project** tab.

- Click **Export**.
- Click **Project**.
- Choose where you want the file to be exported to.
- In the **File name** box, type a name for the file, and then click **Save**.

When the Export is complete MudShark will notify you with an alert in the bottom right hand corner of your screen.

Tip: *To quickly open the folder a file has been exported to; click on the alert that MudShark shows you when the export has completed.*

Importing Projects

If you receive a BBX file from another user or want to restore an older version of a Project:

- Click the **Project** tab.
- Click **Import Project**.
- Choose the file you want to Import.
- Click **Open**.

7. Plans

MudShark has been designed from the ground up to maximise efficiency when dealing with digital plans.

MudShark can read DWG, DXF, PDF, BMP, PNG, JPG files as well as other common image formats.

Regardless of the type of file you are using in your project before any Take Off is undertaken it is imperative that you ensure that **all of your plans are correctly aligned and scaled** so that all Take Off is correct.

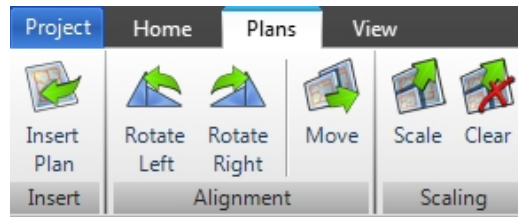
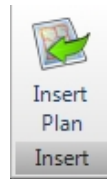


Figure 19. The Plan tab provides the tools needed to set up Plans for Take Off.

Insert Plan



To use a Plan inside a Project you need to Insert it:

- Click **Insert Plan** on the **Plans** tab.
- In the **Open** window select one or more files that you want to insert as Plans into your Project.
- Click **Open** to confirm your selection.

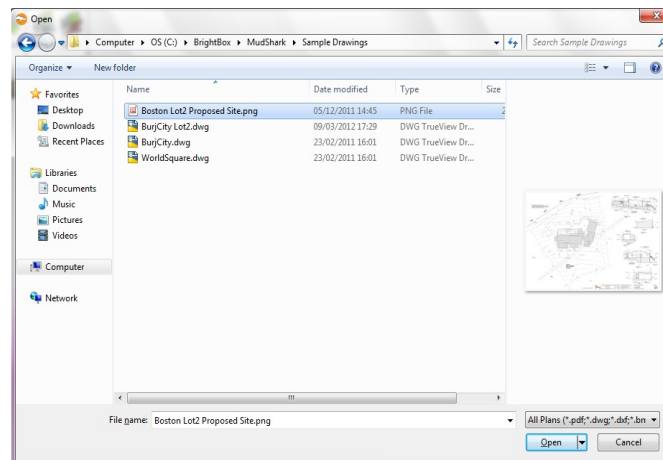


Figure 20. Open window allows you browse to the location of the Plans.

Tip: You can drag any number of valid Plan files into MudShark and the Plan(s) will be inserted into the current Project.

Once a Plan is inserted into your Project it can be seen in the **Plan List** pane.

You can use this Pane to:

- Change the visibility of Plans or their layers by clicking in the check box to the left of the Plan name.
- Select Plans or their layers by clicking on the names

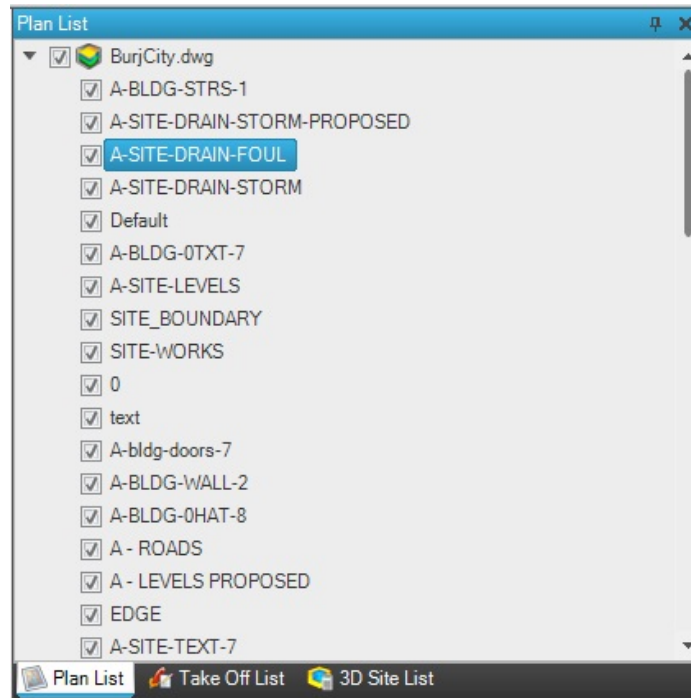


Figure 21. The **Plan List** pane shows you a list of all the loaded Plans and their layers.

Note: For PDF files with multiple pages a Plan will be inserted for each page of the file.

Aligning

If you are calculating a Project that contains multiple Plans you need to ensure that those plans are correctly aligned so that the Take Off and subsequent cut and fill calculations are correct. An example of this would be where one Plan is provided for the Existing Site and another for the Proposed Site.



Rotate

Some Plans are inserted in such a way as to make reading the information on them difficult. To aid in this you can rotate your Plans in 90 degree increments:

- Select the Plan(s) you want to rotate in the **Plan List** by clicking on their names.
- Click **Rotate Left** or **Rotate Right** in the **Alignment** group on the **Plans** tab.

If you get your Plans and they are rotated at different angles you can use the **Custom Rotate** button.

- Select the Plan(s) you want to rotate in the **Plan List** by clicking on their names.
- Click **Custom Rotate** in the **Alignment** group on the **Plans** tab.
- In degrees enter the **Rotation angle** to indicate by how much you want to rotate the selected **Plan(s)**.
- Click the direction button to rotate the Plan(s) either left or right by the **Rotation angle**.
- You can rotate the selected Plan(s) as many times as you need until they are aligned correctly.
- Click **OK**.

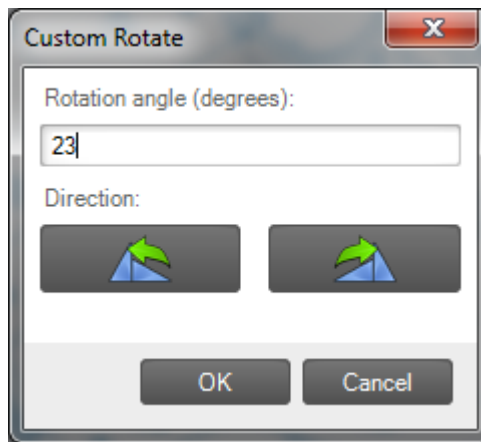


Figure 22 Custom rotate selected Plans by the Rotation angle.

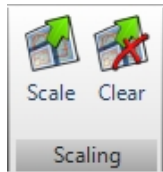
Move

If data points on Plans don't align you can move your Plans so that all their data points are perfectly aligned:

- Click on the name of the Plan you want to move in the **Plan List** pane.
- Click **Move** in the **Alignment** group on the **Plans** tab.
- Click on the reference point of the Plan that you want to move.
- Click where you want to move that reference point to.

Note: You can select more than 1 Plan to move at a time.

Scaling



Before scaling Plans it is recommended that you ensure they are properly [aligned](#). You can Scale each of your Plans separately or if you want to save time you can Scale multiple Plans at the same time using the same scaling line.

To Scale your Plans:

- Select the Plan(s) you want to Scale in the **Plan List** pane by clicking on their names.
- Click **Scale** in the **Scaling** group on the **Plans** tab.
- Choose a line on the plan that you know the length of. The longer the line is on screen the more accurate the scaling will be.
- Click the mouse button at the first point on the line.
- Click the mouse button at the last point on the line.
- The **Scale Plan(s)** window will appear.
- Enter the length of the line.
- Click **Scale** to scale the current selection.

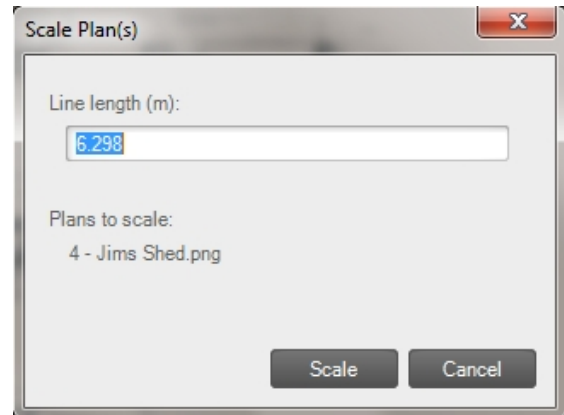
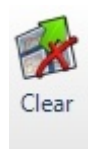


Figure 23. Scale Plan(s) window allows you to type in the length of the scale line.

Clear Scaling

If you make a mistake while scaling a Plan you can rescale the Plan or Undo the scaling operation. However if you prefer you can clear all the scaling from the Plan and start from scratch.



To Clear Scaling from Plans:

- Select the Plans you want to Clear Scaling from in the **Plan List** pane by clicking on their names.
- Click **Clear** in the **Scaling** group on the **Plans** tab.

8. Take Off

Take Off for a Project refers to the process and resultant Entities of transferring the information from a Plan into your Model. Take Off is drawn in the Viewport Workspace using the drawing Tools. Created Take Off is inserted into the correct container in the **Take Off List** pane depending upon the Viewport Mode at the time of Take Off. This information is then used to generate a 3D Model which is used to calculate results.

Working Area

In order to perform calculations MudShark needs to know the boundaries which define the limits of excavation work. That is the area of your Site you want to calculate results for.

You can draw Working Area Boundaries that represent an **Include** area (where work will be taking place) and also **Exclude** areas that are areas where there will be no work. This is useful if there are Existing Structures or areas that you don't want to excavate within the main area of work such as a pond. You can draw as many boundaries nested inside each other as required and MudShark automatically works out if they are Include or Exclude Boundaries for you.

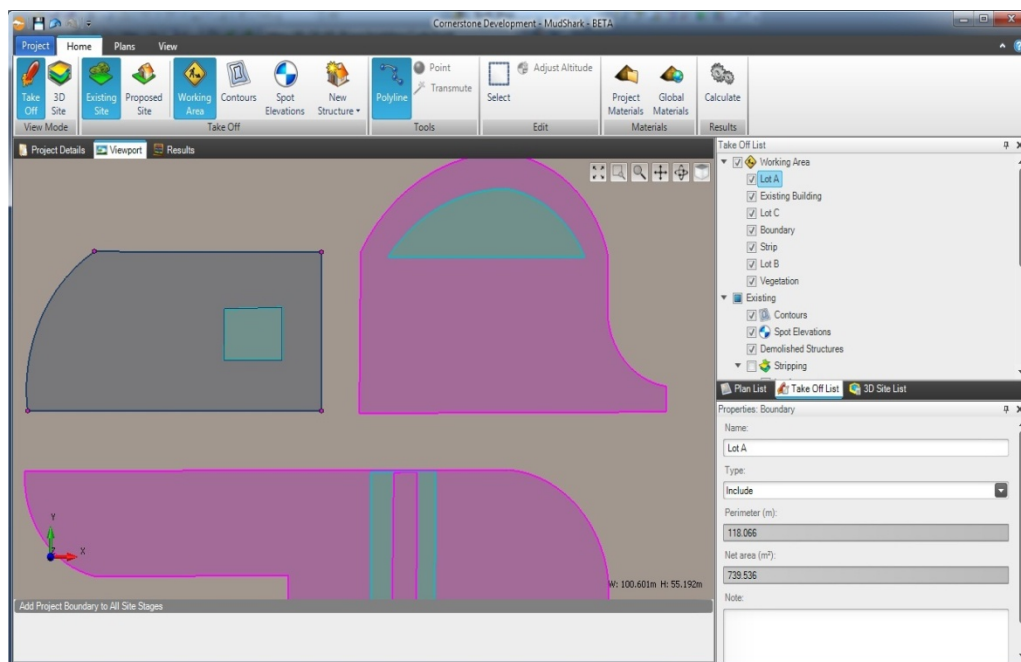


Figure 24. Define the areas in your Project where work takes place.

In order to generate any results MudShark needs at a minimum 1 outermost Include Boundary which denotes an area where Work is to happen. An outermost Boundary is a Boundary that is not enclosed in any other Boundaries. Unlike most takeoff systems you can have as many separate areas of excavation in a Project as you require and there are no limits to the number of outermost Include Boundaries that a project can have. This allows you to keep all of your Projects work in a single Project, instead of spread out over multiple Projects.

Unlike all other Take Off, when taking off Working Area it doesn't matter which Site Stage is the Active Site Stage, all Working Areas are added to the Project.



Figure 25. Ribbon configured to Add **Working Area** Boundaries to the Project.

To draw a Working Area Boundary:

- Click **Working Area** in the **Take Off** group on the **Home** tab.
- Trace the points for the Projects Working Area Boundary in the **Viewport** pane.
- When you have clicked on all the points of the shape click the right mouse button and the Boundary will close.

Boring

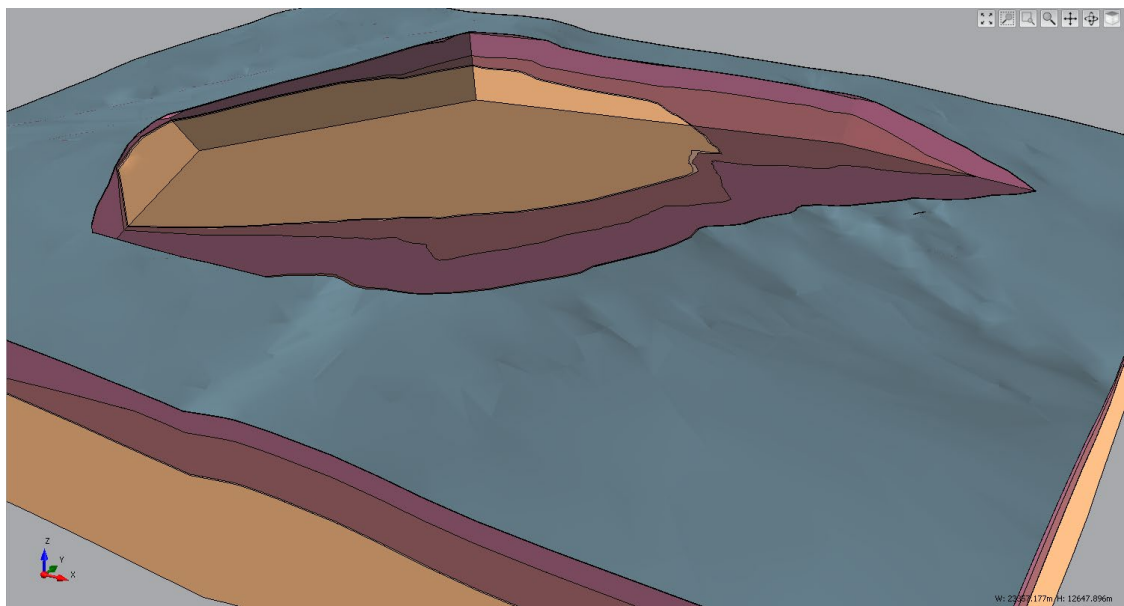


Figure 26 Site generated with multiple borings

A Boring represents a soil sample at a given location on a construction site. Multiple borings aid in modelling the initial ground strata from which excavation is undertaken and returning more accurate results.. They contain ordered layers of Materials specifying the thickness of each material. MudShark uses these values to calculate the volumes of each



Material.

Figure 27 Ribbon configured to Add **Borings** to the Project.

Create a new Boring

Borings can be entered one at a time from Plans or alternatively enter all the details of the Borings upfront in the **Boring Log** pane then plot these details in the **Viewport**. Details of all your Borings for a Project can be found in the **Boring Log** pane, alternatively you can browse the Borings in the **Take Off** pane and edit the details of each in the Property pane.

New Borings in the Viewport

- Click the **Boring** tool in the **Take Off** group of the **Home** tab.
- Click on the Boring point in the Viewport.
- In the **Boring Point** window enter a Name, Altitude and Note for the new Boring.
- Define the **Boring data** see Defining Materials for a Boring
- Click **OK**

Material	Thickness (m)	Note
Topsoil	0.200	
Subsoil	0.800	Sandy/Clay
Silty	1.200	Very loose...
* Type or Select...	0.100	
Total	2.200	

Figure 28. Boring Point window about to add B-2 boring.

New Borings in the Boring Log Pane

- Click on the **Boring Log** pane
- In the Boring Log grid click in the **Name** cell of the **Insert new Boring** row.
- Type the identifying Name, Altitude and Note for the Boring.
- Define the Borings Materials see Defining Materials for a Boring
- To add more Borings click on the new **Insert new Boring** row or click on the **Add... Boring** button at the bottom of the grid.
- Repeat for all of your Borings

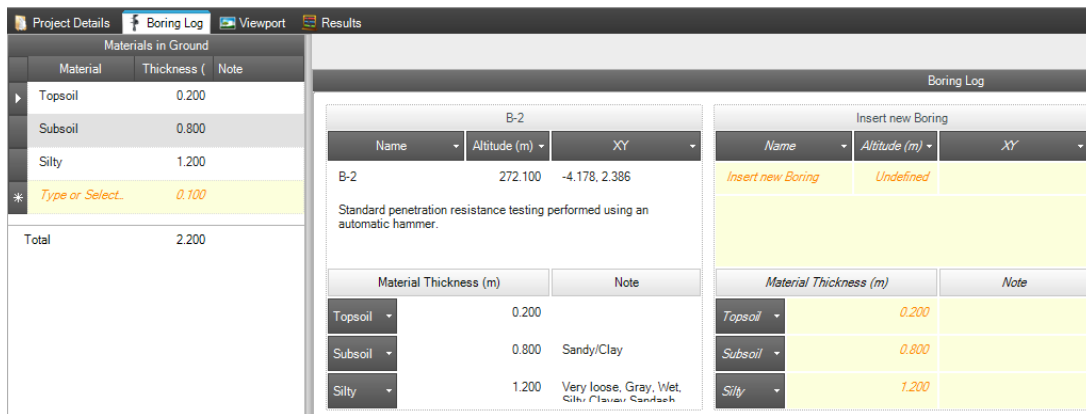


Figure 29 Changing values in the **Insert New Boring** row will create an unplotted Boring.

Plotting an Existing Boring

Creating Borings in the Boring log can be more efficient and less prone to entering incorrect numbers. However you will need to plot the Boring that you have created in the Viewport. That is position it in the Viewport.

- Click the **Boring** tool in the **Take Off** group of the **Home** tab.
- Click on the Boring point in the Viewport.
- From the **Name** list select the Boring that you want to position.
- Check the Boring information is correct.

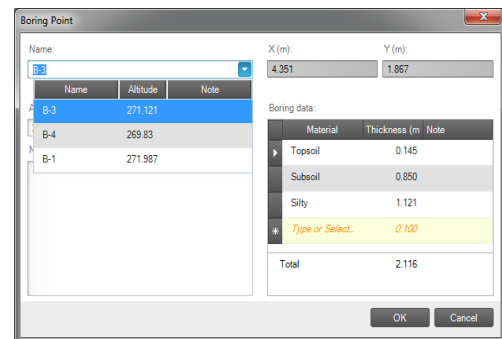


Figure 30. Select the **Name** of the **Boring Point** you want to plot.

If you misposition a Boring point you can always move it by selecting the Boring and using the Move Selection tool.

Defining Materials for a Boring

Each Boring point uses the same list of Materials which defines the order that Materials appear in the ground. This list can be defined in the **Boring Log** pane in the **Materials in Ground** list or alternatively entered on the fly in the **Boring Point** window when plotting Borings.

Changing the Materials that are used in the ground can affect Borings that are already entered. For example deleting a Material out of the **Materials in Ground** list will remove that Material from all existing Borings.

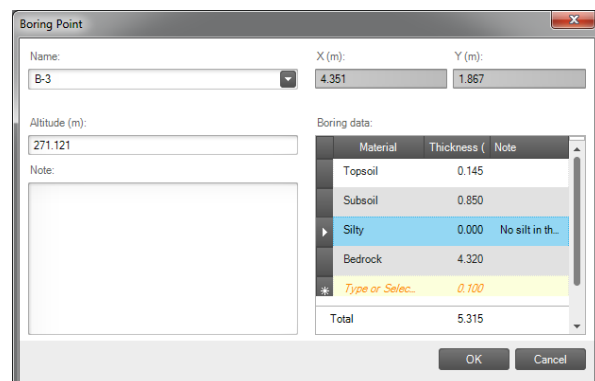


Figure 31. The **Silty** layer is set to 0 as it doesn't occur in this Boring.

Once the ordered Material list is created you can enter in thicknesses and Notes for each Boring segment. If a Boring doesn't contain a Material enter a value of Zero. MudShark can handle Stratum that do not cover your entire site.

Note: If you are using average depths for Materials over a site you can just define the Materials in Ground and the calculation will work off the default thicknesses provided.

Contours

A Contour line represents a geographical entity where each point on the line is at the same altitude and is frequently used to indicate topography of the Site.

You can Take Off Contours for both the Existing and Proposed Site. It is important to ensure the Site you want to add the Contour to is the active Site before you begin Take Off.



Figure 32. Contours are being Taken Off.

Tracing

While generally it is quicker to Transmute your Contours not all Plans lend themselves to efficient Transmuting. In these scenarios you can trace your Contours into the Viewport Workspace using the Task Panel to efficiently enter the Contours altitudes.

Next altitude: the altitude that will be assigned to the next Contour that you draw.

Increment is the difference in altitude between the Contours you are drawing. Usually you will only have to enter this value once per Project. After you have completed your next Contour this increment will be applied to the value in the **Next altitude** box.

Direction indicates that current direction of the slope you are taking off. That is are you taking off Contours that are increasing in elevation, remaining flat or decreasing in elevation. This control makes it very easy to Take Off sites with an undulating surface as you don't need to keep typing in new Altitudes instead simply changing the **Direction** of the Take Off. Once you have added your first Contour changing the direction will change the value of the **Next altitude**.

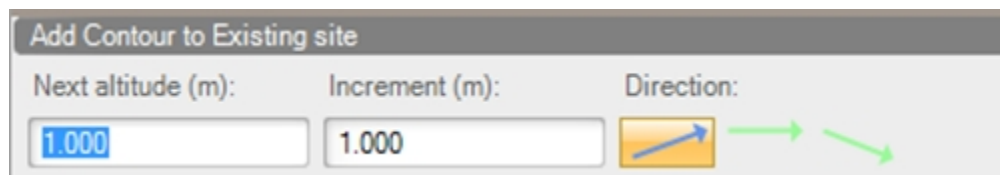


Figure 33. The Task panel sets the altitude of the next Contour.

Tip: If there is vector data on the plan you can snap to the nearest point by holding down the Shift key when moving the mouse over an active viewport.

Transmute

The quickest way to Take Off Contours is by Transmuting. This is only available when you are Taking Off from a Plan that comes from a vector file.

Instead of tracing the Contours on a Plan, Transmuting allows you to pick lines on the Plan that represent Contours. The interaction works the same way as the **Select** tool except you are only able to select Plan Entities. MudShark will then trace a Contour over that line in the Plan.

Tip: Like the **Select** tool you can select a group of Entities by dragging a rectangle around the Entities to Transmute.

The altitude of the new Contour that is created is determined by the **Altitude source** in the **Task Panel**.

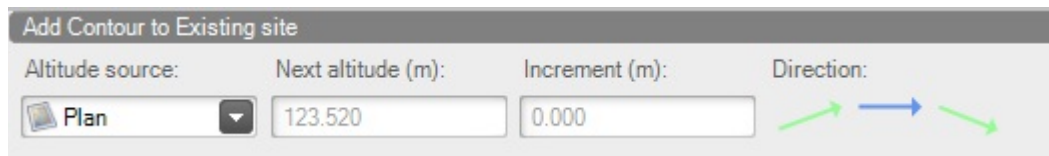


Figure 34. Transmuting Plan Entities into Contours using the altitudes in the Plan.

Plan as the **Altitude source** means that the altitude used when creating the Contour will come from the Plan. Some vector files have 3D data in them where the Contours have been created at the correct height. Where this is the case this is the most efficient option for taking off these Contours. While using the **Plan** as the source the **Next altitude**, **Increment** and **Direction** controls are not needed and are unavailable.

Custom as the **Altitude source** means that the altitude will be defined the same as a Contour that is traced in with the Polyline tool. That is the next Contour that is transmuted will be assigned the altitude in the **Next altitude** box. The **Increment** and **Direction** boxes are available when using the **Custom Altitude source**.

To Transmute a Contour:

- Click on the **Existing Site** or **Proposed Site** in the **Take Off** group on the **Home** tab to activate the correct Site.
- Click **Contours** in the **Take Off** group on the **Home** tab.
- Click **Transmute** in the **Tools** group on the **Home** tab.
- Select the **Altitude source** that you want to use for Transmuting. If you click the **Custom** enter values for the **Next altitude** and **Increment** boxes.
- Click on the line in the Viewport from the Plan you want to use.

Tip: When **Transmute** is active you can Transmute all visible Entities in the Viewport by making the Viewport active and then pressing **Ctrl + A**. Make sure that only the Entities that you want to Take Off are visible and that none of these Entities cross each other.

Spot Elevations

To Take Off elevations at a single point in either the Existing Site or Proposed Site use Spot Elevations.

Figure 35. The **Next altitude** will be assigned to the next Spot Elevation that is input.

To input a Spot Elevation:

- Click on the **Existing Site** or **Proposed Site** in the **Take Off** group on the **Home** tab to activate the correct Site.
- Click **Spot Elevations** in the **Take Off** group on the **Home** tab.
- Click **Point** in the **Tools** group.
- In the Task Panel type the **Next altitude**.
- Click in the Viewport where you want the Spot Elevation created.

By eliminating the need to navigate or have windows popping up and obstructing your view we have been able to greatly increase the speed and accuracy with which you can input multiple points into the Viewport.

Inputting multiple Spot Elevations:

- After creating your first Spot Elevation and while the Viewport Workspace has focus.
- Type the altitude of the next Spot Elevation.
- MudShark inserts the altitude in the **Next altitude** box in the Task Panel.
- Click in the Viewport where you want the Spot Elevation created.

Structures

In MudShark a Structure is any item on a Site that is being demolished or built. Structures are entered by Taking Off each Structures Boundaries and entering in each Structures Material Layers. Each Site Stage can have as many Structures as required.

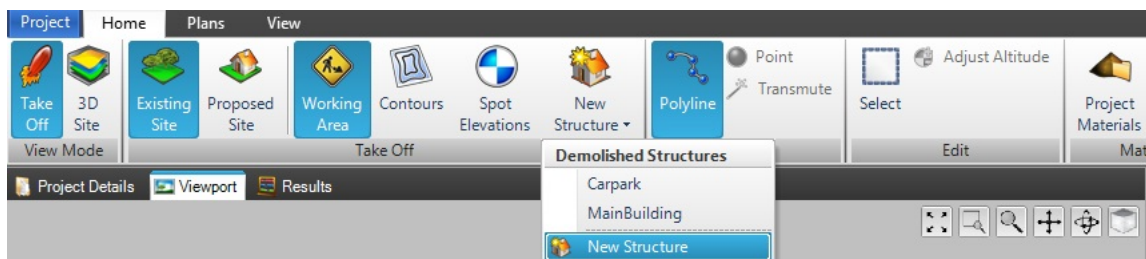


Figure 36. The **Demolished Structures** menu allows you to edit Structures or create a **New Structure**.

Demolished Structure

A Structure that needs to be removed from the Site is called a **Demolished Structure** and should be created in the **Existing Site** Stage. For example if a Site requires the removal of a driveway.

Built Structure

A Structure that is being added to the Site as part of the works is called a **Built Structure** and should be created in the **Proposed Site** Stage. For example if a site requires laying down a foundation slab.

Unchanged Structures

Structures that already exist and aren't being changed as part of the works should be Taken Off as an Excluded **Working Area**.

For example if there is a building that is being extended and it falls inside the Working Area of Excavation that Structure should be taken off as an Excluded Working Area Boundary.

For more information on Taking Off Working Area Boundaries please refer to Working Area section at the start of this chapter.

Create a New Structure

Before you can Take Off a Structures Boundaries you need to Create a New Structure:

- Click on the **Existing Site** or **Proposed Site** in the **Take Off** group on the **Home** tab to activate the correct Site.
- Click **New Structure** in the **Take Off** group on the **Home** tab.
- The **New Structure** window will appear.
- Enter information about your Structure. For more information about entering Materials see Structure Materials section.
- Click **Create**.

Materials in Strata	
Material	Thickness (m)
* Type or Select a Material	0.100
Totals	
	0.100

Figure 37. The **New Structure** window allows you to define properties of the Structure before adding it to the active Site.

Once you have added a Structure it will be added to the drop down underneath the Structures tool. This list of Structures is filtered based on the currently Active Site Stage.

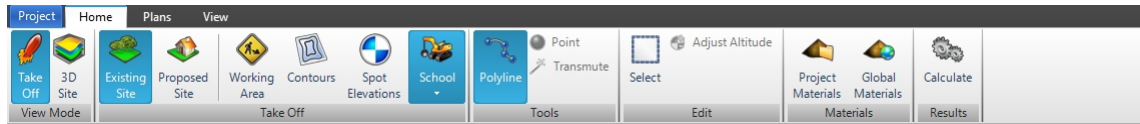


Figure 38. Ready to Take Off Boundaries for the School Structure that will be demolished.

You are now able to start Taking Off your new Structures Boundaries.

Taking Off Structure Boundaries

Drawing a Structures Boundaries is similar to drawing the Boundaries of the Working Area. You can define the Area that makes up a Structure by tracing Include Boundaries that define the area that the Structure includes and Exclude Boundaries whose areas are removed from the Structure. Allowing complex Structure shapes to be input quickly and intuitively.

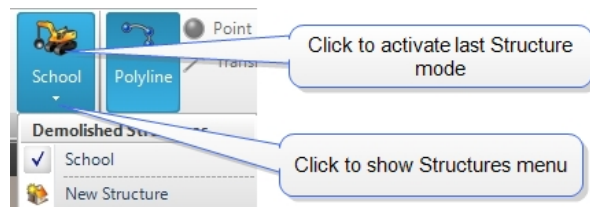


Figure 39. New Structures can be created from the Structures menu.

You can add as many top level Include Boundaries as you want for a single Structure. If you have 3 building pads that are made up of the same Materials you can Take Off all the building pads as a Single Structure. This means you only need to enter in the Materials for that Structure once and all the results will be grouped together.

To add Boundaries to a Structure you must first activate the Structure that you want to draw Boundaries for:

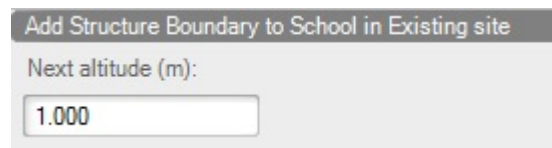
- Click on the **Existing Site** or **Proposed Site** in the **Take Off** group on the **Home** tab to activate the Site that contains the Structure you want to add Boundaries for.
- On the **Home** tab in the **Take Off** group click the drop down section of the New Structure control.
- Click the name of the Structure you want to add Boundaries for. If the Structure does not exist you can create a **New Structure**.

While a Structure is active any Take Off you draw will be added as a Boundary to that Structure.

Note: MudShark will automatically recalculate the appropriate Respread and Stripping areas in real time as you are Taking Off the Structures Boundaries.

Point Altitudes

Unlike a Working Area Boundary each point on a Structure Boundary is input at a specific altitude.



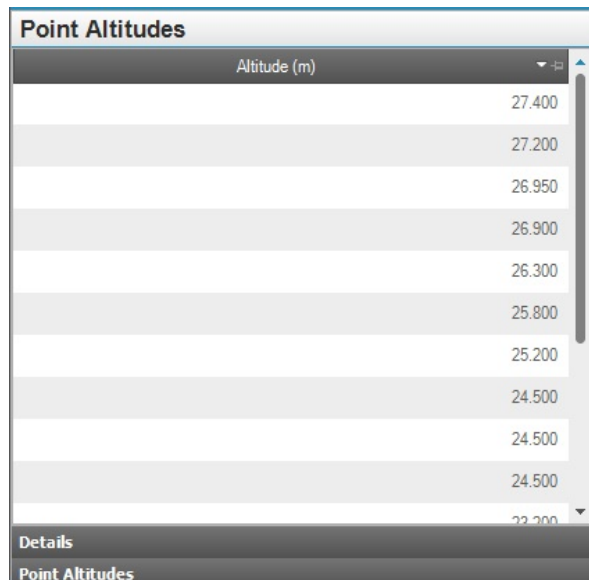
The value in the **Next altitude** box in the Task Panel corresponds to the altitude that the next point of the Structure will be assigned.

Note: When a Structure Boundary is joined to form a closed shape the value in the Next Altitude box is ignored and the altitude of the first point is applied to the last point.

To edit the altitudes of a Structure Boundary:

- Select the Structure Boundary in the **Take Off List** pane.
- Click **Point Altitudes** in the **Properties** pane.
- Click on the **Altitude** you want to change. Once a cell is selected the point you are about to change is highlighted in the Viewport.
- Type the new altitude for the point in the cell.

Figure 40. The altitude applied to the next point on the current Structure Boundary.



Point Altitudes	
Altitude (m)	
27.400	
27.200	
26.950	
26.900	
26.300	
25.800	
25.200	
24.500	
24.500	
24.500	
22.200	

Details

Point Altitudes

Figure 41. Structure Boundary Property pane showing the altitude of each point in a Structure Boundary.

Structure Materials

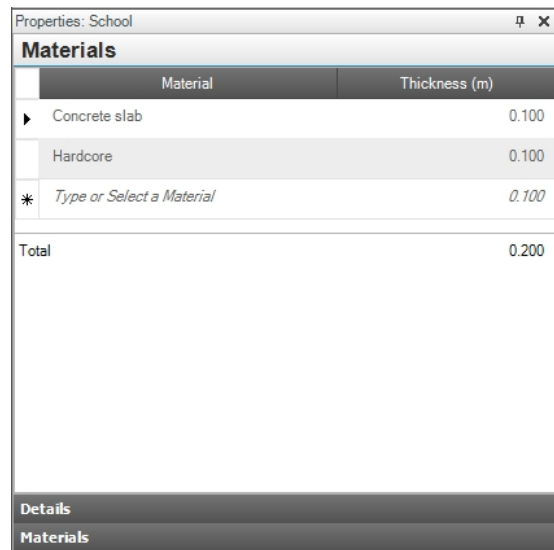
You can define the Materials that make up your Structures and this will give you more accurate results for the Cut and Fill across the site as well as volumes for the Structures themselves.

This information can be defined in the New Structure window or edited at a later time by:

- Select the Structure you want to edit in the **Take Off List** pane.
- Click **Ground Layers** in the **Properties** pane.
- Change the Materials as required.

The order that the Materials are displayed is the order they appear in the Structure working from the top surface of the structure down.

Note: For more information about adding Materials into your Project see the [Materials section](#).



Materials	
Material	Thickness (m)
▶ Concrete slab	0.100
Hardcore	0.100
* Type or Select a Material	0.100
Total	
0.200	

Figure 42. The Materials that make up a Structure can be edited in the Structures Property pane.

Stripping and Respread

In most other cut and fill programs you are required to enter the Stripping and Respread areas manually which can involve retracing the Working Area and Structure boundaries again. To save you time MudShark calculates the areas for Stripping and Respread automatically based on the Take Off that you have already completed.

You can view the Take Off for the Stripping and Respread at any time as the boundaries are updated in real-time as you complete your Take Off and can be found in the **Take Off List** pane under the Stripping and Respread container items.

To calculate your Stripping and Respread values you need to enter a thickness for each. This can be done in the **Project Details** pane under the **Ground Settings** tab or in the **Properties** pane when either the Stripping or Respread item is selected.

With the inclusion of Multiple Borings you can now specify stripping by the layer or layers of soil you want to strip rather than by thickness.

To specify Stripping by layer:

- Click the **Project Details** pane.
- Click the **Ground Settings** tab.
- Click **Strip away** and select the last layer of soil you want to strip away. This will strip any Material higher in the list as well as the Material that you choose to remove.

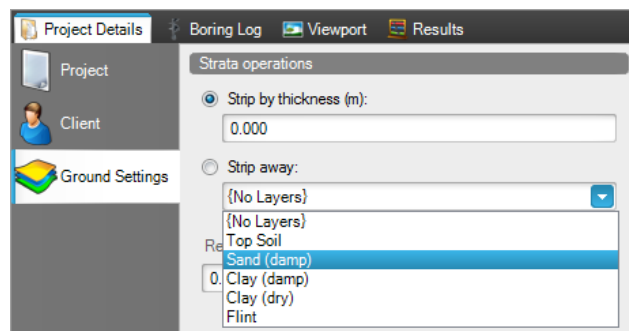


Figure 43. Click **Strip away** to remove 1 or more soil layers before cut and fill calculations.

Tip: You can strip away more than 1 Layer. For example

if you have three layers in your strata Organic Matter; Topsoil and Subsoil you can strip away both Organic Matter and Topsoil by clicking to strip away Topsoil. This will strip all Topsoil and any layers above topsoil.

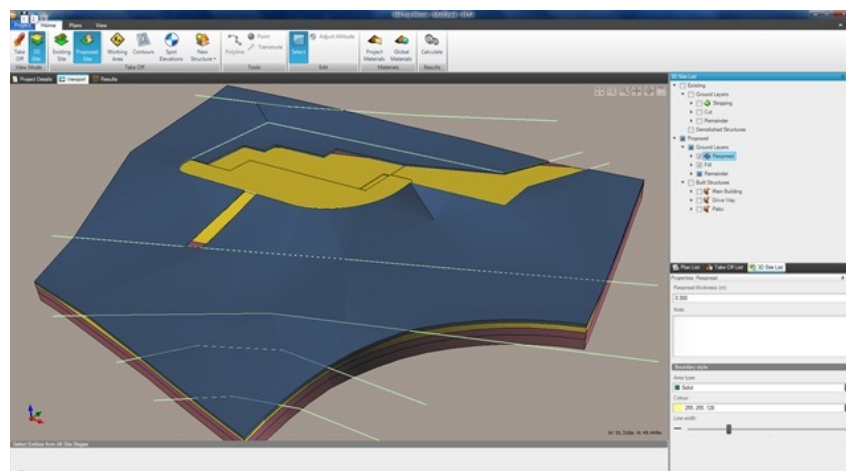


Figure 44. 3D Site view of the Proposed Site Stage with Respread selected.

Editing

Once you have finished drawing the Take Off you are able to change properties of that Take Off. The usual way to do that is to select the Take Off Entity in the **Take Off List** pane and then edit the properties in the **Properties** pane. Editing your Take Off is a good way of balancing your site and some time spent exploring options for your site can save you or your clients a large amount of money.

Adjusting Altitude

Sometimes you may need to adjust the Altitude of a few points in your Take Off Entity. You may want to move the Altitude of all your Structure points higher or lower to adjust the overall Site Balance. Or perhaps you made a mistake and accidentally put an entire 50 point Structure in at an Altitude of 1m instead of 5m.

In these cases the standard method of editing Altitudes one at a time in different Properties pane controls can be tedious and time consuming. Rather than do this you can:

- Select all the Take Off which contains points you want to Adjust from the Take Off List pane.
- Click **Adjust Altitudes** in the **Edit** group on the **Home** tab.
- The **Adjust Altitude** window will be shown.
- Clicking on **Relative adjustment** or **Absolute value**.
- Enter a value in the correct box.
- Click **OK**.

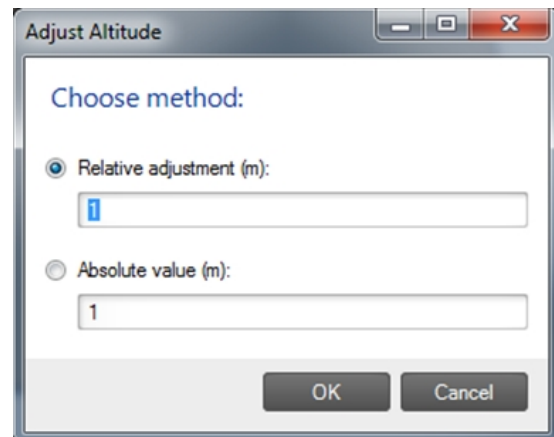


Figure 45. Change the altitude of multiple Take Off Entities simultaneously with the **Adjust Altitude** window.

Relative adjustment will increase or decrease the altitude of all the selected Take Off points by the value in the box. A positive number will increase the Altitude of the selected points while a negative value will decrease the Altitude of the selected points.

Absolute value will set the Altitude of each selected Take Off point to the value in the **Absolute value** box. If you make a mistake all changes made in the **Adjust Altitude** window are undoable.

Move Selection

You can change the location of takeoff items on a site in either Take Off or 3D view. This visual movement allows you to quickly change where items such as structures will be located on a site. The interaction for moving takeoff is similar to moving a plan:

- Select the takeoff you want moved in the **Take Off List** pane by clicking on the name(s) of the takeoff. In Figure 38 two structures are selected to be moved.
- Click **Move Selection** in the **Edit** group on the **Home** tab.
- In the viewport click on a reference point of what you want to move.

- In the viewport click where you want to move that reference point to.

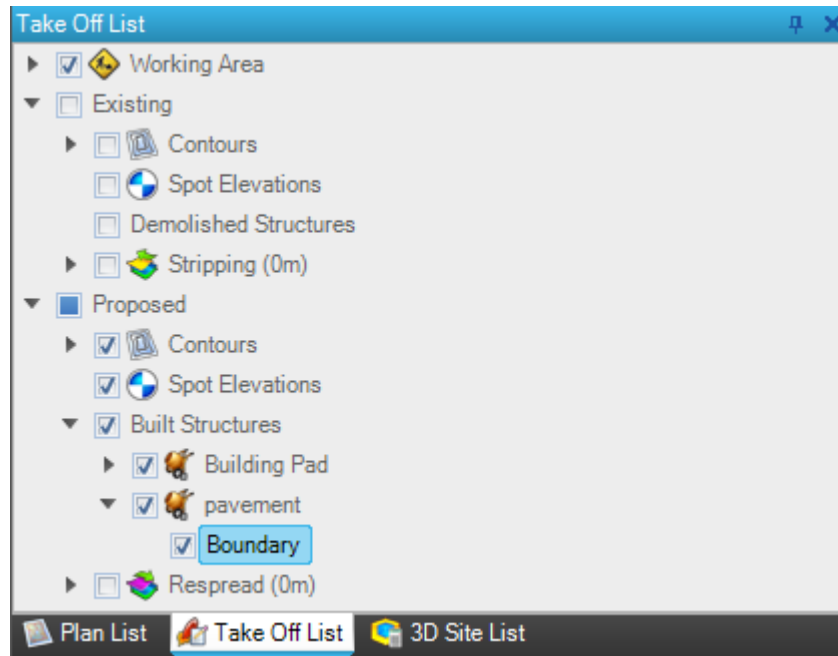


Figure 46: Select takeoff to move in the **Take Off List** pane.

9. Materials

In MudShark all 3D Entities that are created are made up of 1 or more Materials. Each Material has a number of different properties which control how it looks as well as affecting how the Material behaves when subjected to Cut and Fill operations.

Global Materials

If you have Materials that you repeatedly use you can add them into the Global Materials List. These Materials can then be easily used in your Projects without the tedious repetition of typing in the same values all the time.

To access the **Global Materials** list click on **Global Materials** in the **Materials** group in the **Home** tab.

The List comes prepopulated with a number of Materials each organised into a Category. Once a Material is used in a project it is copied into your Project List, changes made to the Global list will not affect any of your existing Projects.

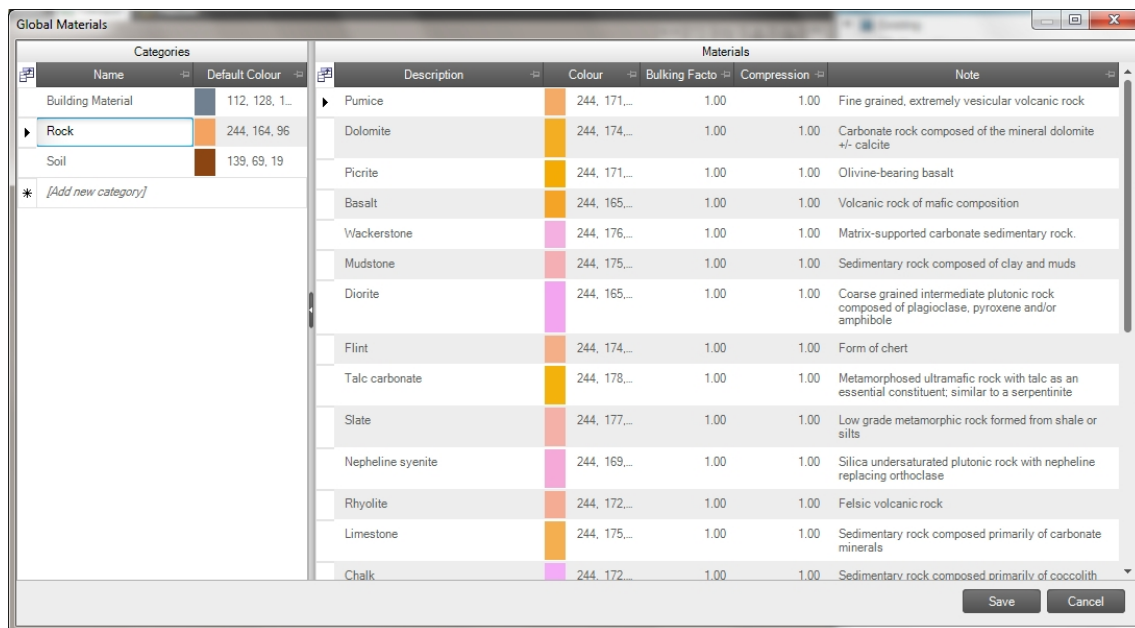


Figure 47. A central collection of all predefined Materials.

Project Materials

Once you use a **Material** inside your Project it will be added to the **Project Materials** List which is accessible under the **Home** tab by clicking Project Materials in the Materials group.

Each Material property that you change on this screen is updated everywhere in the Project where that Material is used. No changes in this window will update any values in the Global Material List.

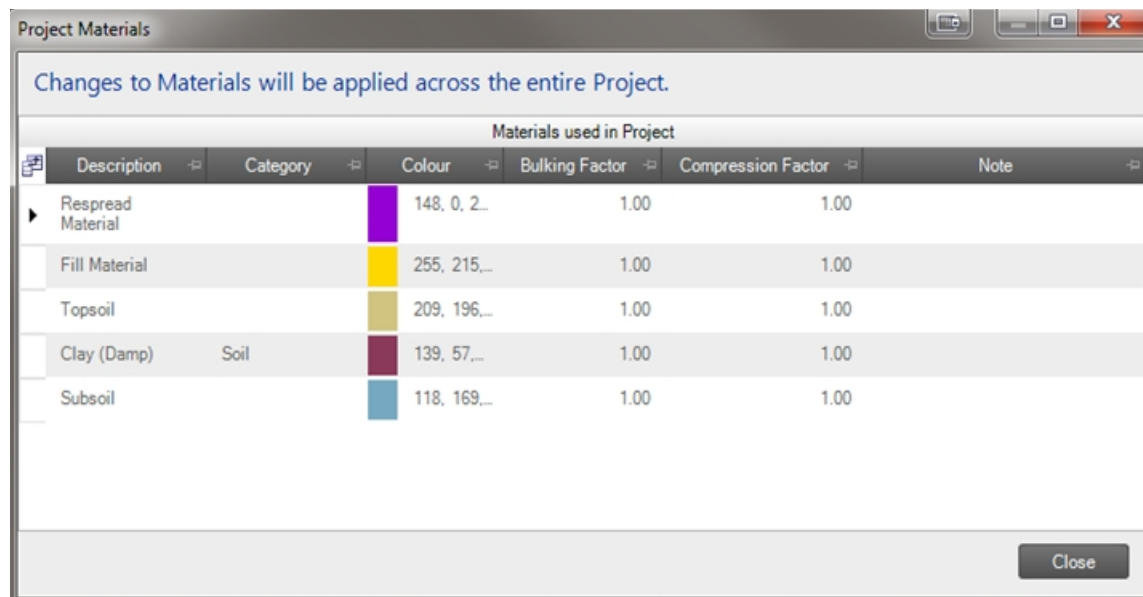


Figure 48. All Materials that have been used in the current Project.

Tip: Selecting a Material in the Project Materials window will highlight that Material in the Viewport, if its use is currently visible.

Factors

Each Material has 2 Factors that adjust how their volumes react to being removed or added to the ground or structure. If you don't know these values for your current Project that is alright however the more accurate the information you have the more accurate the result and reuse calculations will be.

Bulking Factor

When Material is moved out of the ground it will typically swell up to occupy a larger volume. You can use the Bulking Factor to indicate the extent of this Bulking.

For example a Bulking Factor of 2.00 will result in a Material that when it is Cut from the soil will double in volume.

Compression Factor

When Material is added to the ground, as is the case when performing a Fill Strata Operation, the Material will often settle or shrink to be a smaller volume. However in some cases it will end up occupying a large volume. Use the Compression Factor to adjust how the Material behaves in this circumstance.

If you are importing Material from offsite then the Compression Factor will be directly applied to that volume such that a Compression Factor of 0.5 will mean the imported material will halve in volume when it is put into the ground.

If you are reusing Material that has been taken out of the ground the Bulking Factor is first applied in reverse to the Bulk volume to arrive at the Banked Volume and then the Compression Factor is applied to that to calculate the Compressed Volume. If the Materials Bulking Factor is 2 and it's Compression Factor is 0.5 the reused Material will be half of the Banked Volume and 0.25 of the Bulk Volume.

Using Materials

Two Materials are added into a Project by default. That is the **Respread Material** and the **Fill Material** both of which denote the properties of Material that may need to be imported into the Site. Changes made to the Respread Material can affect the Imported Respread Result figures, likewise, changes to the Fill Material can affect the Imported Fill Volumes.

*Note: The default values for both the Respread Material and Fill Material can be changed in the **Options** window. These changes will take effect on the next new Project.*

Elsewhere you can either create new

Materials or pick from Materials that already exist in either the Global Material list or the Project Material list.

Materials are generally added through a Material Grid as shown in Figure 41.

To insert a Material:

- Click in the cell of the Material Grid where you want to insert the Material.
- Type the name of the Material.
- If the Material name doesn't already exist a new Material will be created and added to the Project Materials list.
- If the name of the Material does exist then the currently selected Material in the drop down will be used. With a reference to the Material added to the Project list.

Tip: If you prefer you can browse the existing Materials by clicking on the drop down arrow in the Material column cell where you are inserting the Material.

Note: You can delete a Material from where it is being used by clicking on the row selector in the Material grid and pressing the Delete key.

The screenshot shows two windows from a software application. The 'Initial Ground Strata' window contains a table with the following data:

Description	Category	Colour	Bulking Factor	Compression Factor	Note
Aplite	Rock	244, 164, 196	1.00	1.00	Very fine grained intrusive igneous rock
Asphalt	Building Material	108, 254, ...	1.00	1.00	
Basalt	Rock	244, 165, 40	1.00	1.00	Volcanic rock of mafic composition
Bitumen macadam	Building Material	109, 34, 116	1.00	1.00	
Blockwork	Building Material	109, 192, ...	1.00	1.00	
Brickwork	Building Material	109, 232, ...	1.00	1.00	
Chalk	Rock	244, 172, 248	1.00	1.00	Sedimentary rock composed primarily of calcareous fossils
Clay (damp)	Soil	139, 57, ...	1.00	1.00	

The 'Operations' window shows input fields for 'Stripping thickness (m):' with a value of 0.600 and 'Respread thickness (m):' with a value of 0.100.

Figure 49. Selecting Materials from the Global and Project List to be inserted into a Material grid.

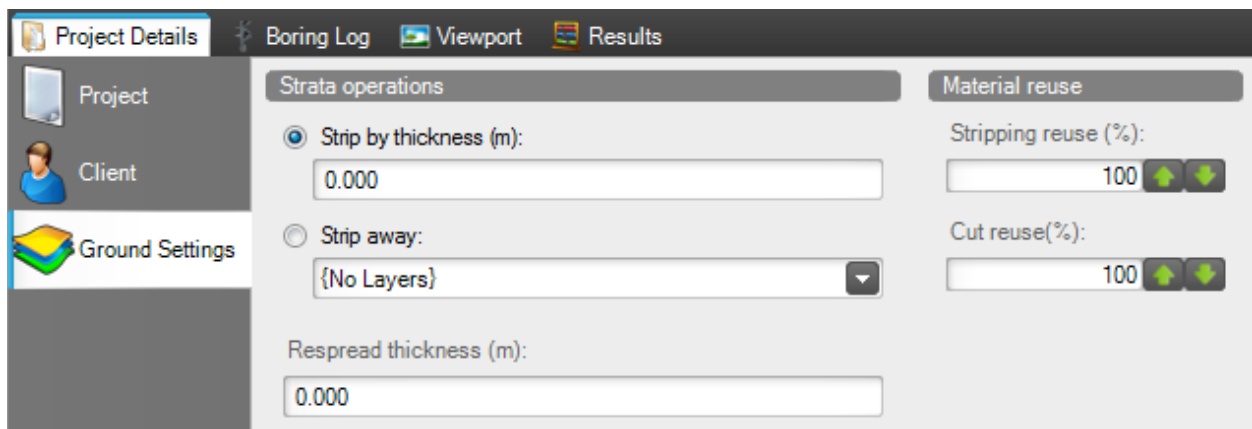
10. Results

Ground Setup

The final results are greatly affected by a number of parameters such as the initial state of the Existing Site Strata as well as the thickness of Stripping and Respread and how much reuse is estimated to occur between Strata Operations.

These settings can be accessed in either the Boring Log pane or the **Ground Settings** tab of the **Project Details** pane.

More information on Stripping and Respread settings can be found in the Stripping and Respread section of the Take Off chapter.



The screenshot shows the 'Ground Settings' tab in the 'Project Details' pane. The 'Strata operations' section has three settings: 'Strip by thickness (m)' is set to 0.000, 'Strip away' is set to {No Layers}, and 'Respread thickness (m)' is set to 0.000. The 'Material reuse' section has two settings: 'Stripping reuse (%)' and 'Cut reuse (%)', both set to 100% with up/down arrows for adjustment.

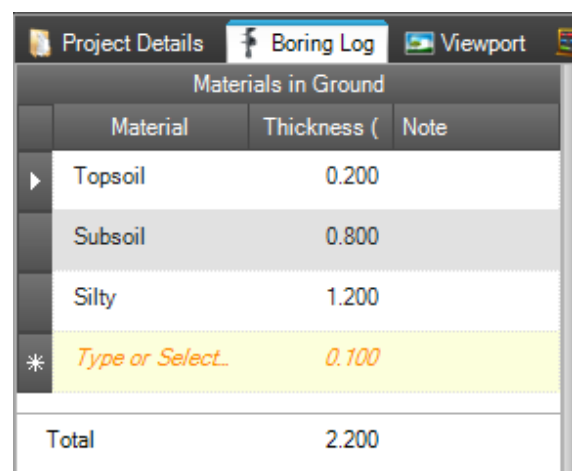
Figure 50. The **Ground Settings** contain information about how calculations will be carried out.

Initial Ground Strata

The **Materials in Ground** and the **Boring Log** grids define the Material that make up each of the Stratum in the Existing Site Stage. With the order they appear in the grid representing the order they appear in the ground. That is the Material in the first row of the grid represents the Material just below the surface.

If no Stratum are entered for the Initial Ground Strata then a default Stratum comprising the default Existing Soil Material will be created. This Stratum will have a thickness automatically calculated for it.

More information on how to enter Multiple Boring information is available in the Boring section of the Take Off chapter.



Materials in Ground			
	Material	Thickness (Note
▶	Topsoil	0.200	
	Subsoil	0.800	
	Silty	1.200	
*	Type or Select...	0.100	
Total		2.200	

Figure 51. Materials in the ground can be defined in the **Boring Log** pane.

Material Reuse

Sometimes when performing Cut Strata Operations a proportion of the soil you are taking out won't be available for reuse either because it is not suitable or because during the process some of the Material will be wasted. To cater for this scenario you can define the percentage of Material removed from the ground which is then available for reuse as Fill or Respread.

Stripping Reuse is the percentage of Stripping volume that will be available for reuse as Respread.

Cut Reuse is the percentage of Cut volume that will be available for reuse as Fill.

Calculating Results

MudShark can calculate Results for the following:

- Stripping Area and volumes.
- Cut Volumes in Open Ground and beneath Structures.
- Fill Volumes in Open Ground and beneath Structures.
- Respread Area and volumes.
- Structure Material volumes.
- Material Reuse.
- Site Balance volumes.

You can wait until you have finished all your Take Off before calculating your results however if you do not have all the information available you are still able to get an accurate estimate based on the data you currently have.

To calculate results MudShark requires at least:

- 1 Include Working Area Boundary
- 1 Elevation Entity (Contour or Spot Elevation) in the Existing Site stage.

Once you have this information entered for your Site you can calculate the results at any time by clicking **Calculate** in the **Results** group. The more Site data you have entered the longer it will take for calculation to complete, but you will have far more accurate results.

If you make changes to your Take Off, Material factors or other information which can affect results, recalculation will be necessary.

After the results are calculated you are able to verify and explore the results in the fully interactive 3D **Viewport** as well as getting a detailed breakdown of all the results in the **Results** pane.

Navigating Visual 3D Results

We recommend that you validate all results that MudShark calculates and a visual validation is quite often the quickest way to achieving that. After Calculation there should be no gaps between 3D Site Entities in the Viewport. The Viewport provides the perfect medium for visual verification as you can freely navigate around your entire Site or isolate areas of interest.

When exploring the results in 3D we recommend switching the **View Mode** to **3D Site** as this changes the camera to use perspective to give the Viewport a deeper feel. This is available on the **Home** tab.

After clicking on **3D Site** in the **View Mode** group by default the Existing Site Stage is displayed as it appears before any Strata Operations. You can expand the items in the **3D Site List** pane changing the selection or visibility of any items so that you can visualise and concentrate on the parts of the Site that are important to you.

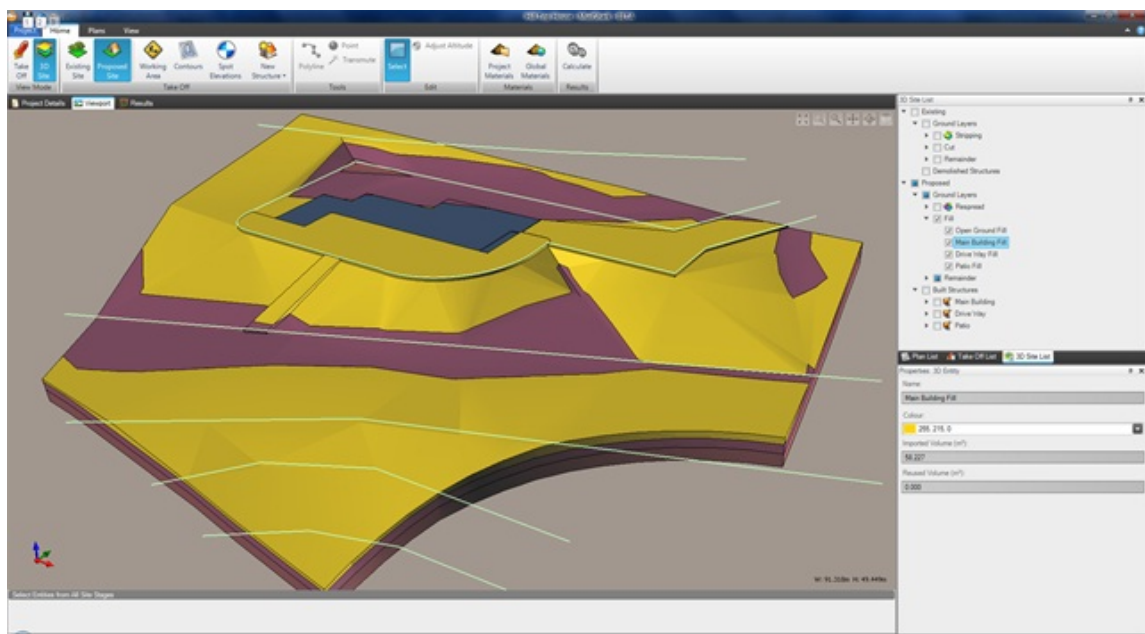


Figure 52. 3D Site view of the Proposed Site Stage with Structure Fill selected.

Once you have finished viewing the Existing Site Stage you can switch to the Proposed Site Stage by clicking **Proposed Site** in the **Take Off** group on the **Home** tab. Alternatively you can manually change the selection using the checkboxes in the **3D Site List** pane.

Note: If you then click **Existing Site** while in 3D the visibility that was last active when you were viewing the 3D Site will be restored. Likewise if you switch back to **Take Off View Mode** the visibility of items that was on during your last Take Off will be restored.

Note: Any view in the Viewport can be exported as either an image or a 3D vector file. For more information see **Exporting Results**.

Edge Style

You can alter the visual style that the 3D entities are displayed with; increasing or reducing the contrast of the 3D entities in the Viewport.

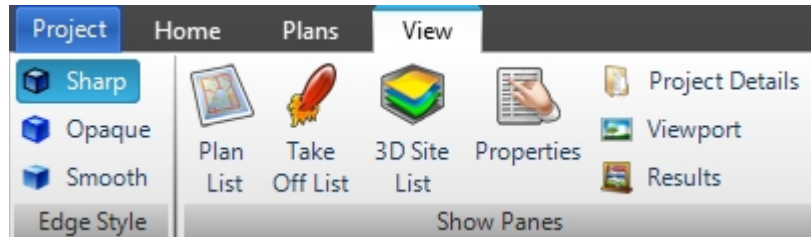


Figure 53. The View tab offers three Edge Styles for your 3D Entities.

- **Sharp** Edges are highlighted with a black line.
- **Opaque** Edges are highlighted with a colour derived from the colour of the Entity.
- **Smooth** Edges are not highlighted.

Calculation Troubleshooting

Occasionally when you attempt to calculate results for your site you will be informed that your site could not calculate or the 3D results will look wrong.

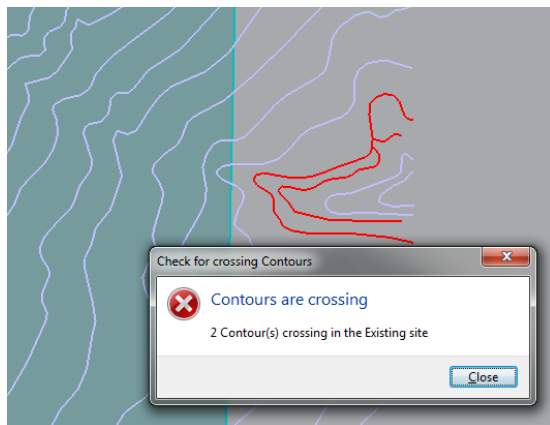


Figure 54 Check Contours can highlight errors in contours

You may have traced or transmuted contours that cross each other. This is usually the case when transmuting from a file that contains errors. MudShark can highlight crossing contours for you:

- Click on **Check Contours**
- Any crossing Contours will be highlighted in red in the **Viewport** pane.
- Correct the highlighted Contours.
- Click **Calculate** again.

If you have a site that has a large hole in it or appears much thicker than it should you may have entered the structure at an incorrect altitude.

Results Grid

All the Volume results are collated, filtered and grouped into task oriented sections and are accessible to you in the **Results** pane where the Solid Model, Material Factors and reuse calculations are applied to present a grid of results. This view gives you a more detailed breakdown of the results than you would get if you were looking at the Viewport in isolation.

What Information is Available

The **Results** pane allows you quickly see the Total **Cut** Bulk Volume for a single Strata Operation, a single Material or the Entire Site. And of that, how much **Exported** Bulk Volume needs to be taken off Site and how much is **Reused** in other places on the Site.

Furthermore you can see the total compressed volume for the **Fill** and a breakdown of how much of that was reused **From Site** versus what will need to be **Imported** from off Site.

This information is then summarised as a Bulk **Site Balance**. This shows which items have a net effect of requiring Materials to be removed from the Site or brought in from somewhere else. A negative number indicates a net effect of Material being removed from the Site. You can then use the Site Balance values to adjust your earthwork plans to try and achieve the optimal material reuse.

Operation Group	Exported (Bulk m³)	Reused (Compressed m³)	Cut (Bulk m³)	From Site (Compressed m³)	Imported (Bulk m³)	Fill (Compressed m³)	Site Balance (Bulk m³)
Stripping	7,348.074	1,160.222	8,508.296				-7,348.074
Strata							
Stripping	7,348.074	1,160.222	8,508.296				-7,348.074
Material							
Existing Soil	3,093.926	1,160.222	4,254.148				-3,093.926
Stratum							
Existing Soil	3,093.926	1,160.222	4,254.148				-3,093.926
Hardcore	1,933.704		1,933.704				-1,933.704
Stratum							
Hardcore	1,933.704		1,933.704				-1,933.704
Soil stabilisation me...	2,320.444		2,320.444				-2,320.444
Stratum							
Soil stabilisation.	2,320.444		2,320.444				-2,320.444
Fill					7,348.035	7,348.035	7,348.035
Strata							
Open Ground Fill					7,348.035	7,348.035	7,348.035
Material							
Fill Material					7,348.035	7,348.035	7,348.035
Respread				1,160.222		1,160.222	
Strata							
Respread				1,160.222		1,160.222	
Material							
Respread Material							
Existing Soil				1,160.222		1,160.222	
Total	7,348.074	1,160.222	8,508.296	1,160.222	7,348.035	8,508.257	-0.039

Figure 55. Results can be grouped by Strata Operation and Materials then expanded or collapsed to display exactly what you want to see.

Filters

There are a number of built-in filters that you can apply to your Result data. These comprise 2 predetermined groupings:

Strata Operation groups the data by the Strata Operation that affects them (e.g. All Stripping under a single group).

This allows you to easily see volumes that relate to each Operation regardless of what type of Material it is made up of.

Material groups all the results by the type of Material they are so that you can better see how much of each Material is being used and where it is being used on the Site.

For each grouping you are able to drill down into ever finer detail that shows where the result has come from.

Moreover you can filter these groups so that you are only able to see volume results from Structures, the Ground or both.

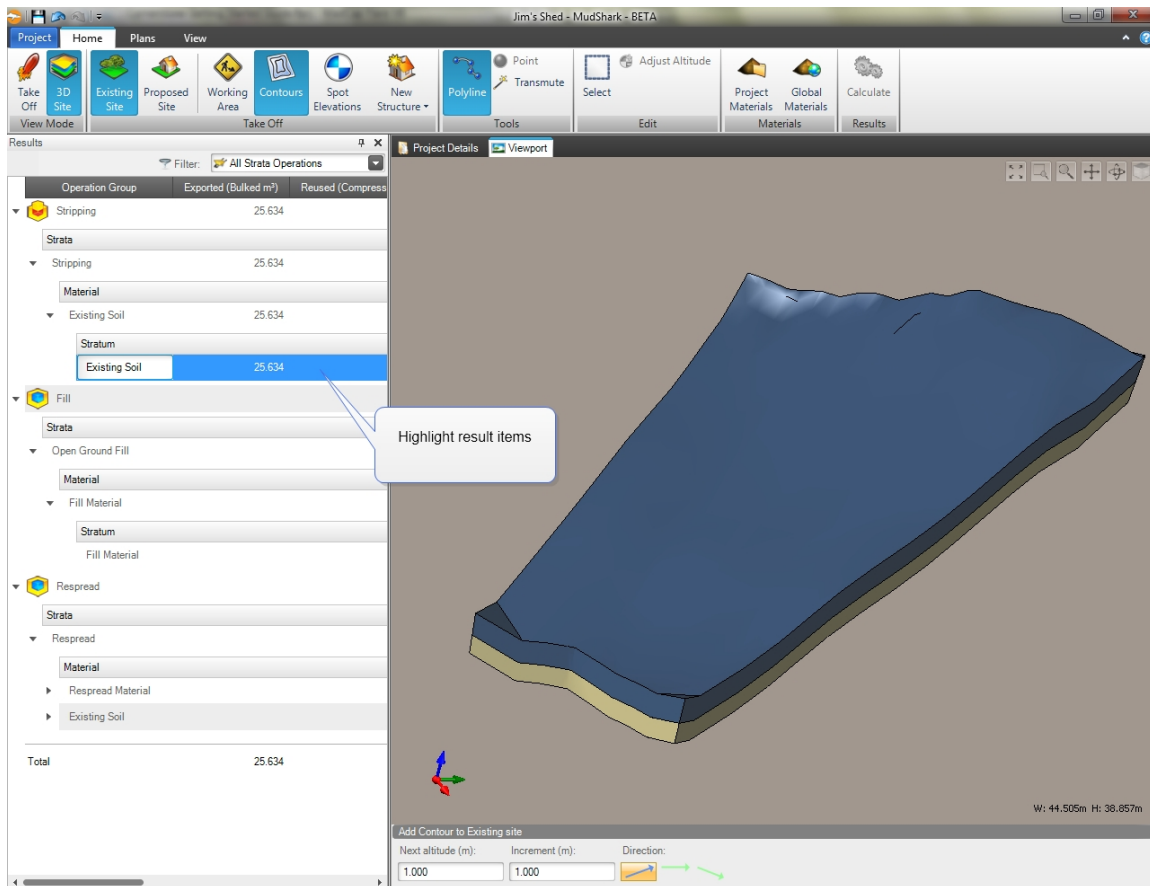


Figure 56. The results can be highlighted and audited in a 3D View.

Tip: Selecting items in the results grid will highlight them in the Viewport to help associate and identify the relationship between the 3D Site and the Results.

Exporting Results

Both your visual and tabular results have been designed so that they can be reused in your workflow with powerful exporting to commonly used external file formats.

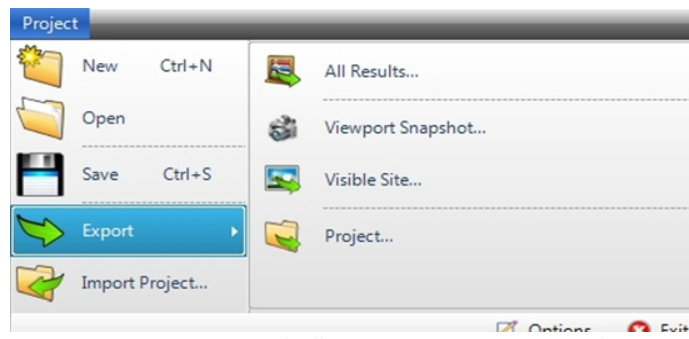


Figure 57. Project tab allows you to **Export** your results.

Microsoft Excel

To Export all the results shown in the **Results** pane into a format that is easily shared and reusable:

- Click the **Project** tab.
- Click **Export**.
- Click the **All Results**.

The Excel file is created so that a separate tab is defined for each different result filter. Additionally the data is formatted in such a way that you can interact with the data groups in a similar way that you would in MudShark will expandable and collapsible group; so that you are able work with only the data that you need.

	A	B	C	D	E	F	G	H
1	Stripping	25.636589	25.636589	51.2673178				25.6336
13	Fill					25.6336589	25.6336589	25.6336
14	Open Ground Fill	Strata				25.6336589	25.6336589	25.6336
15								
16								
17								
18								
19								
20	Fill Material		Material			25.6336589	25.6336589	25.6336
21								
22				Stratum				
23	Fill Material					25.6336589	25.6336589	25.6336
24								
25								
26								
27	Respread				25.6336589		25.6336589	
28								
29		Strata			25.6336589		25.6336589	
30	Respread							
31								
32			Material					
33	Respread Material							
34								
35				Stratum				
36	Respread Material							
37								
38			Existing Soil				25.6336589	
39								
40				Stratum				
41	Existing Soil				25.6336589		25.6336589	
42								
43								
44								
45	Total	25.634	25.634	51.267	25.634	25.634	51.267	0
46								
47								
48								
49								
50								
51								
52								
53								
54								
55								
56								

Figure 58. A comprehensive Microsoft Excel workbook is produced with multiple sheets by Strata Operation and Materials.

Tip: If you do not have Microsoft Excel a number of different programs exist that can read data from these files including many Estimating systems.

Viewport Snapshot

The currently framed visible entities in the Viewport can be exported as an image file for your records or for reuse in third party applications. You can take as many snap shots as you need (from any angle) and you can turn on any Entities from your Plans, Take Off or 3D Site to capture in an image.

When taking a snapshot we recommend putting MudShark in the same **View Mode** as the type of data you are capturing. That is **Take Off** mode for an accurate top down look onto the Sites Take Off and **3D Site** for any view where you want to see perspective on your entities.

To Export a Viewport Snapshot:

- Click the **Project** tab.
- Click **Export**.
- Click the **Viewport Snapshot**.
- In the **File Name** box type a name for the file.
- From the **Save as Type** box select the type of image you want to create.
- Click **Save**.

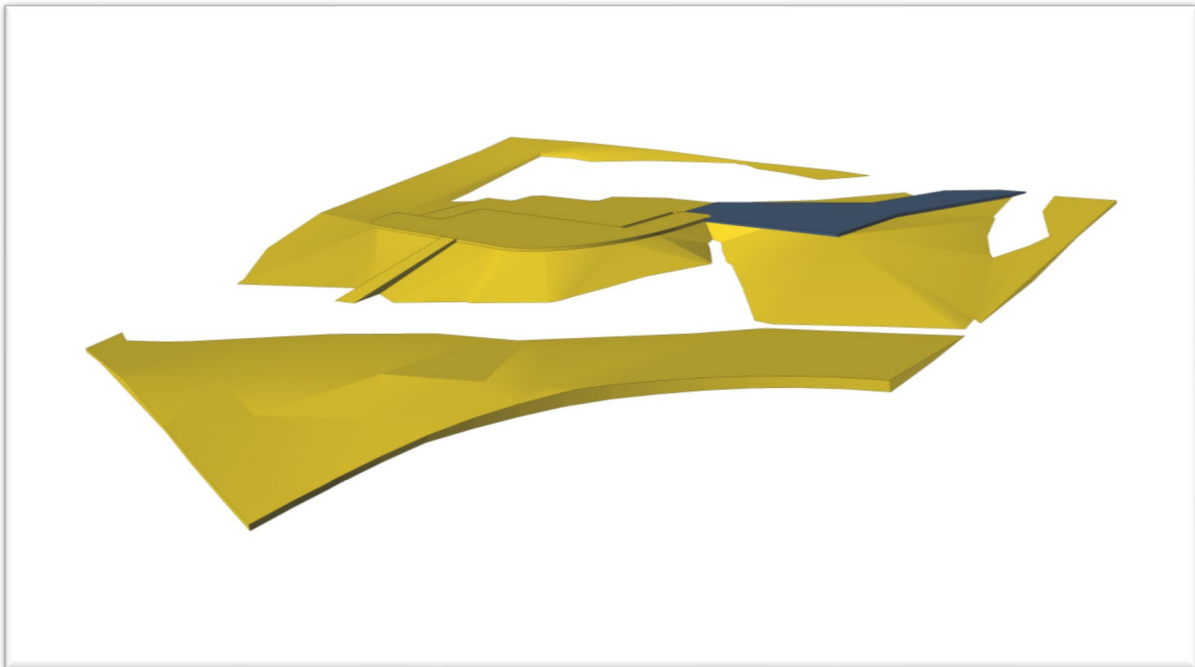


Figure 59. A Viewport snapshot can be taken from any angle with all Entities that are visible within the frame of the Viewport.

Export 3D Vector Data

All currently visible Entities in the Viewport can be exported to a 3D vector file for use in other applications. To export different views of your data you change the visibility of your Entities to suit. These files can then be reused in Take Off on other applications; integrated into your BIM workflow or used for 3D printing.

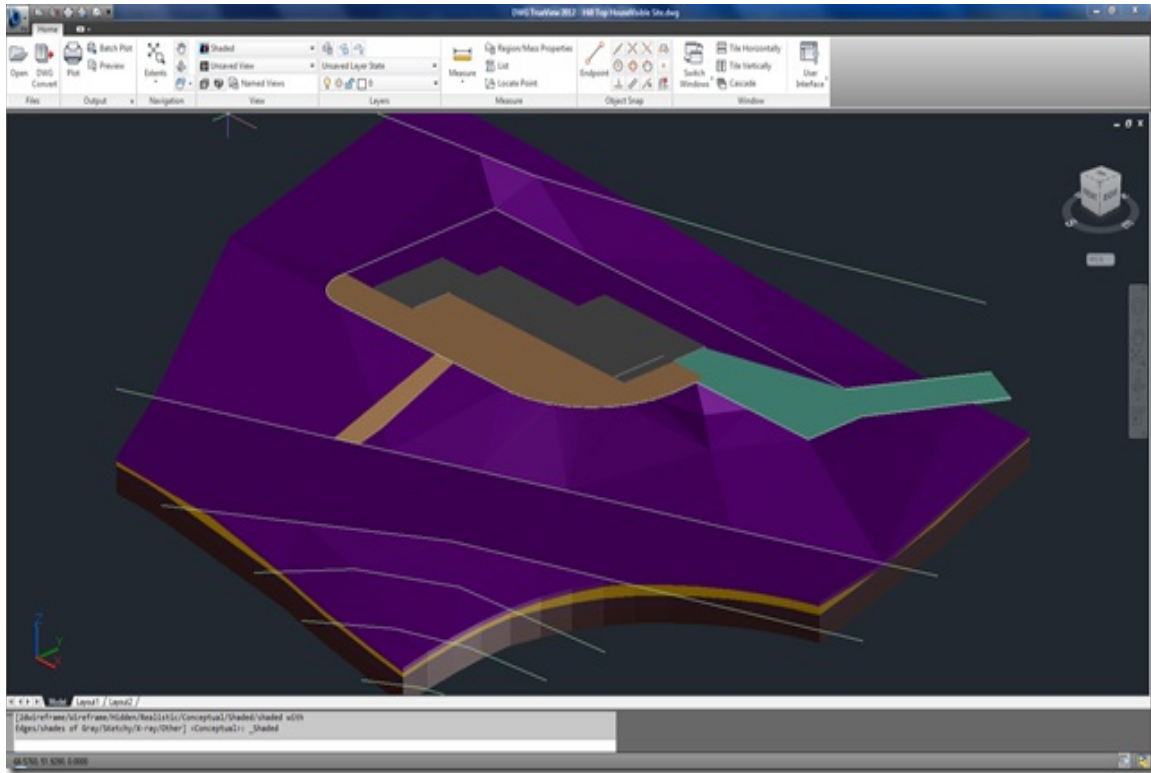


Figure 60. Exported 3D vector data can be put to use in 3rd party software applications.

To Export the Visible Site:

- Click the **Project** tab.
- Click **Export**.
- Click **Visible Site**.
- In the **File Name** box, type a name for the file.
- From the **Save as Type** box select the type of file you want to create. To create a file for 3D Printing click **3D Print STL**.
- Click **Save**.

Appendix A. Keyboard and Mouse Shortcuts

General

Key	Meaning
Delete	Delete current selection.
Ctrl+S	Save the current Project.
Ctrl+O	Open a Project.
Ctrl+N	Create a New Project.
Ctrl + Shift + N	Create a New Structure.
Ctrl+Z	Undo.
Ctrl+Y	Redo.
Ctrl+C	Copy text from a control.
Ctrl+V	Paste text into an editable control.
Ctrl+ right arrow	Move the insertion point to the beginning of the next word.
Ctrl + left arrow	Move the insertion point to the beginning of the previous word.
Ctrl+Tab	Cycle through pane windows.
Ctrl+F4	Close the active pane if that pane can be closed.
Ctrl + 1	Show Plan List pane.
Ctrl + 2	Show Take Off List pane.
Ctrl + 3	Show 3D Site List pane.
Ctrl + 4	Show Properties pane.

Ctrl + 5	Show Project Details pane.
Ctrl + 6	Show Viewport pane.
Ctrl + 7	Show Results pane.

Viewport

Key	Meaning
Ctrl+A	When Select or Transmute are active will perform the operation on all visible Entities in the Viewport.
Delete	Delete current selection
Arrow keys	Pan the Viewport Workspace in the direction indicated.
Ctrl + 0	Perform Zoom Fit on Viewport.
Ctrl + J	Joins the end point to the start point when Taking Off.
Rotate the mouse wheel	Changes the zoom used in the viewport.
Click the mouse wheel button and drag	Pans the viewport.
Ctrl + click the mouse wheel button and drag	Rotates the viewport.

List Panes

Key	Meaning
Asterisk (*) on numeric keypad	Display all sub-Items under the selected Item.
Plus sign (+) on numeric keypad	Display the sub-Items directly under the selected item

Minus sign (-) on numeric keypad	Collapse the Items directly under the selected Item group.
Left arrow	Collapse the current selection (if it is expanded) and move focus to the group leaf root.
Right arrow	Display the sub-items directly under the selected Item (if it is collapsed).
Ctrl+Up arrow	Scroll the list without changing the selection.
Ctrl+Down arrow	Scroll the list without changing the selection.
Any printable key or keys	Moves the selection to the Item matching the prefix letters in the beginning of the label.

Appendix B. System Requirements

Software

Recommended Operating System: Windows 10 (64 bit)

Supported Operating Systems: Windows 7/8/8.1/10/Vista & Windows Server 2003/2008

Required Software: NET Framework 4 & SQL Server Express 2005 SP2 or later.

Hardware

For best results, we recommend using a 2 button mouse, with a scroll wheel. For activation, and deactivation, an active internet connection is also required.

	Minimum	Recommended
Intel Processer (or AMD equivalent)	I5 2.6 GHz	I7 2.6 GHz
Memory	8+ GB Ram	8+ GB Ram
Graphics Card	1 GB Ram Open GL 2.0 or higher compatible card with up to date drivers	2 GB Ram Open GL 2.0 or higher compatible card with up to date drivers
Hard Drive Space	1 GB free space	1 GB free space

Glossary

3

3D Site

Three dimensional visualisation of existing/proposed site and the results.

A

Active Site/Active Site Stage

The Site Stage that is currently being worked on. Newly added Take Off will be added to the active site stage.

Application Menu

The menu that is displayed when you click the Project tab. The application menu contains common tools for creating, saving, and publishing a Project.

B

Banked Volume

Is the volume of material in its natural state, e.g. in the ground before work is undertaken or when it is brought on site.

BBX

Mudshark file extension for an exported project.

Boring

The thicknesses of the soil in the initial ground at a given point.

Boring Segment

An individual definition of a Material and it's thickness inside a Boring.

Boundary

A Boundary that defines an area where work will be carried out.

Built Structure

A new Structure entity on the Proposed Site.

Bulked Volume

The total volume of earth that has been extracted from the ground to which the bulking factor has been applied.

Bulking Factor

The factor at which the material expands when removed from the ground. The factor used is based on the banked or natural state of the material.

C

Compressed Volume

The total volume of earth that has been added to the ground to which the compression factor has been applied.

Compression Factor

The factor by which the Material will settle/shrink when added to the ground. The factor used is based on the banked or natural state of the Material.

Container

An item in a list pane that contains or can contain Items.

Contour

A line on a Plan which has an altitude value.

Cut

The volume of material needed to be excavated from the site.

Cut Reuse Percentage

The percentage of cut Material that can be reused as Fill.

Cut Volume

The volume of Material excavated from the Site.

D

Demolished Structure

A Structure Entity that has to be removed from the existing Site.

Dock

Describes the function when a window is positioned left/right/top or bottom of the screen.

DWG

DWG ("drawing") is a binary file format used for storing two and three dimensional design data and metadata.

DXF

Drawing Exchange Format. A file format that enables the exchange of drawings between AutoCAD and other programs.

E

Elevation Source

Selecting how contour altitude data will be entered.

Entity

An item that has a visual representation in the viewport.

Exclude Boundary

An area not used in the calculation of results.

Existing Site Stage

The site stage before any takeoff is carried out.

Exported Volume

The volume of material to be taken off site.

F

Fill

The volume of material needed to be added to the site.

Fill Volume

The volume of material that has been added to the site from both reused and imported material.

From Site Volume

The volume of material re-used from site.

G

Global Material

A central collection of all predefined default materials available to all projects.

I

Imported Fill Material

The volume of material brought from off site for fill purposes.

Imported Respread Material

The volume of material brought from off site used for Respread.

Imported Volume

The volume of material brought from off site for fill purposes and/or respread.

Include Boundary

An area used in the calculation of results.

Increment

Is the amount the contour altitude will increase/decrease by for the next contour entity.

Item

An Entity or Container in a list Pane.

N

Net Area

Is the area of all the included areas with the excluded areas removed from it.

O

Operation Group

Is the grouping of all like Strata Operations. Such that there may be multiple cuts that get grouped together.

P

Pane

A component of the application designed to display the properties of the entity being worked on.

PDF

Portable Document Format. A file format created by Adobe used to transmit and display documents regardless of the software of the sender or receiver. It includes fonts, formatting, and graphics.

Plan

Is a drawing representation of a site stage..

Plan Layer

Layers are the primary organizational tool used in Plans. Layers are the equivalent of the overlays used in paper-based drafting.

Point

A single coordinate within the viewport.

Polyline

A continuous line composed of one or more line or arc segments used for takeoff.

Project

Represents the entirety of your work (Earthwork Calculations).

Project Material

All materials that have been used in the current project.

Project Tab

The button that is displayed in the top-left corner of the application. If you click the application button, the application menu is displayed.

Proposed Site Stage

The site stage after all takeoff is carried out.

Q

Quick Access Toolbar

A Toolbar where you place common functionality likely to be used across different tabs. e.g. you might save the project while working on the home tab or while you are manipulating plans.

R

Raster File

A file containing one or more raster images where the image is represented by pixels.

Remainder

Material that is left over after all Strata Operation has been completed and which no Strata Operation has altered.

Respread

Is putting a layer of soil over the top of an excavated site.

Reused Volume

The volume of excavated material from the site that has been reused

Ribbon

The horizontal area of the application window where a set of toolbars are placed on tabs

S

Site

Is a geographical location where work is planned to take place.

Site Balance

The difference between the material resued and the imported material expressed as a volume.

Snap

Is a help mode where if you are in a drawing mode e.g. spot or is polyline and the cursor is within a certain range of a point (any point, it may not be on an object) the input will snap to that point.

Spot Elevation

Is a point on a plan which has a altitude value.

Stratum

Is a ground layer of Rock or Soil with similiar characteristics distinguishing it from other layers.

Stripping

The volume of topsoil removed from the site for possible reuse.

Stripping Reuse Percentage

The percentage of stripped material that can be reused as respread

Structure

Any man made entity that can appear in either existing or proposed site stage.

Structure Boundary

The perimeter of the structure (see "Structure").

Structure Material

Any material below finish floor level that makes up the 3D structure entity.

T

Takeoff

Takeoff is the entering of site entity data in the viewport for existing/proposed site stages.

Toolbar

A row of icons that represent related tools. Each icon, when clicked, invokes an action.

Transmute

A tool that can select a contour entity directly from a vector file.

V

Vector File

A file containing graphical data in vector form such as lines shapes, e.g. dwg,dxf.

Viewport

The graphical interface where you perform Take Off from Plans and view your 3D Site results.

W

Working Area

The area in which work will be and won't be carried out.

Working Area Boundary

A component that forms all or part of the working area. A working area can contain multiple Working Area Boundaries.

X

X Reference

External reference attached to a vector file.

List of Figures

Figure 1. MudShark interactive 3D visualisation.....	6
Figure 2. Suggested MudShark workflow	8
Figure 3. Main user interface components in MudShark.	9
Figure 4. Clicking on an Embedded panes tab with the right mouse button.	10
Figure 5. Docking Overlay controls appear when you drag panes around the screen to allow you to dock and embed them.	10
Figure 6. Take Off List pane with multiple Items visible in the Viewport.	11
Figure 7 Properties pane showing information about the currently selected Entities.	12
Figure 8. Active Modes are highlighted in the ribbon.	14
Figure 9. Current Take Off Task is adding Contours to the Existing Site.	15
Figure 10. The Viewport displaying a Project with the Working Area and Contours for the Existing Site Stage entered.	16
Figure 11. The Select tool active for the entire Site.	18
Figure 12. The Contours Polyline tool active for the Existing Site Stage.....	19
Figure 13. The Spot Elevations tool active for the Existing Site Stage.....	20
Figure 14. Transmuting a group of Entities.....	21
Figure 15. The Open Project window allows you locate and open your Projects quickly.....	22
Figure 16. Custom Filter window allows you to define complex filters on a column in the Open Project window.	23
Figure 17. Create a Copy of the currently opened Project.....	24
Figure 18. Open the copy of the Project by clicking on this notification.....	24
Figure 19. The Plan tab provides the tools needed to set up Plans for Take Off.	26
Figure 20. Open window allows you browse to the location of the Plans.	26
Figure 21. The Plan List pane shows you a list of all the loaded Plans and their layers.	27
Figure 22 Custom rotate selected Plans by the Rotation angle.	28
Figure 23. Scale Plan(s) window allows you to type in the length of the scale line.....	29

Figure 24. Define the areas in your Project where work takes place.	30
Figure 25. Ribbon configured to Add Working Area Boundaries to the Project.....	31
Figure 26 Site generated with multiple borings.....	31
Figure 27 Ribbon configured to Add Borings to the Project.....	31
Figure 28. Boring Point window about to add B-2 boring.....	32
Figure 29 Changing values in the Insert New Boring row will create an unplotted Boring.	33
Figure 30. Select the Name of the Boring Point you want to plot.	33
Figure 31. The Silty layer is set to 0 as it doesn't occur in this Boring.....	33
Figure 32. Contours are being Taken Off.....	34
Figure 33. The Task panel sets the altitude of the next Contour.....	34
Figure 34. Transmuting Plan Entities into Contours using the altitudes in the Plan.	35
Figure 35. The Next altitude will be assigned to the next Spot Elevation that is input.....	36
Figure 36. The Demolished Structures menu allows you to edit Structures or create a New Structure.....	36
Figure 37. The New Structure window allows you to define properties of the Structure before adding it to the active Site.....	37
Figure 38. Ready to Take Off Boundaries for the School Structure that will be demolished.....	38
Figure 39. New Structures can be created from the Structures menu.....	38
Figure 40. The altitude applied to the next point on the current Structure Boundary.....	39
Figure 41. Structure Boundary Property pane showing the altitude of each point in a Structure Boundary.....	39
Figure 42. The Materials that make up a Structure can be edited in the Structures Property pane.....	40
Figure 43. Click Strip away to remove 1 or more soil layers before cut and fill calculations.....	41
Figure 44. 3D Site view of the Proposed Site Stage with Respread selected.....	41
Figure 45. Change the altitude of multiple Take Off Entities simultaneously with the Adjust Altitude window.	42
Figure 46: Select takeoff to move in the Take Off List pane.	43
Figure 47. A central collection of all predefined Materials.....	44
Figure 48. All Materials that have been used in the current Project.....	45
Figure 49. Selecting Materials from the Global and Project List to be inserted into a Material grid.	46
Figure 50. The Ground Settings contain information about how calculations will be carried out.....	47

Figure 51. Materials in the ground can be defined in the Boring Log pane.....	47
Figure 52. 3D Site view of the Proposed Site Stage with Structure Fill selected.	49
Figure 53. The View tab offers three Edge Styles for your 3D Entities.	50
Figure 54 Check Contours can highlight errors in contours.....	50
Figure 55. Results can be grouped by Strata Operation and Materials then expanded or collapsed to display exactly what you want to see.	51
Figure 56. The results can be highlighted and audited in a 3D View.	52
Figure 57. Project tab allows you to Export your results.	53
Figure 58. A comprehensive Microsoft Excel workbook is produced with multiple sheets by Strata Operation and Materials.	54
Figure 59. A Viewport snapshot can be taken from any angle with all Entities that are visible within the frame of the Viewport.	55
Figure 60. Exported 3D vector data can be put to use in 3rd party software applications.	56